Occupancy and Roost Ecology of the Northern Long-eared and Indiana Bat on the Coastal Plain of the North Carolina, U.S. Geological Survey Science Support Program Project G17AC00288 to Virginia Tech

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Northern Long-eared Bat (*Myotis septentrionalis*) – Captured June 20, 2019, at North River Game Land, Currituck County, NC

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ABSTRACT

Information about the probable presence, activity levels, and habitat selection of northern long-eared (*Myotis septentrionalis*) and Indiana bats (*Myotis sodalis*) is limited on the Coastal Plain of the eastern United States, particularly in the mid-Atlantic. Our research objectives were to use ultrasonic acoustic monitoring and active capture to collect presence data for these species and to examine seasonal activity levels and habitat characteristics across a portion of this region. We monitored 63 acoustic monitoring stations during 2017–2019 across the Coastal Plain of North Carolina and Virginia. Of the 14 recorders located in North Carolina, both species were detected at 8 (57%) stations, respectively. We used generalized linear mixed-effects models to examine the effect of various weather variables on nightly bat activity seasonally, and to analyze the influence of various ecological factors on total recorder nights of probable presence per species per recording station. Additionally, we radio-tagged northern long-eared bats at or near the North Carolina Wildlife Resource Commission's North River Game Land to determine day-roost selection, roosting home range size, and second- and third-order habitat resource selection. Northern long-eared bat activity peaked during mid-spring and was highest during warm, calm, and dry nights. Indiana bat activity peaked in early spring but, unlike northern long-eared bats, Indiana bat activity decreased with increasing temperatures and was higher during short bouts of precipitation. Recorder nights of northern long-eared bat probable presence increased with decreasing proximity to deciduous and evergreen forests but decreased with respect to mixed and woody wetland forests. Similarly, recorder nights of Indiana bat probable presence increased with decreasing distance to deciduous forests and woody wetlands but decreased nearer evergreen and mixed forests. For day-roosts of northern long-eared bats, 6 tree species were used, but > 50% occurred in suppressed and mid-story water tupelo (*Nyssa aquatica*) or Carolina

ash (*Fraxinus caroliniana*). Most observed day-roosts (> 70%) occurred in cavities. Similar to previous research in other regions, our 50% and 95% utilization distribution (UD) home range estimates were 11.3 ha and 43.6 ha, respectively. At the second-order spatial scale, northern long-eared bats selected for large (> 200 ha) forested wetlands and upland forests, and, specifically, forests nearer open water that contained small canopy breaks. Lastly, at the third-order spatial scale, areas farther from forest edge, non-forest areas, and large forest perforations were selected. Based on these models, and a random sample of the local area (2.5 km buffer), suitable day-roosting habitat appears limited and comprises < 10% of the landscape. Our results suggest the need to conserve complex and large tracts of forested wetlands containing suppressed and mid-story cavity bearing trees. However, the juxtaposition of upland forests appears likely beneficial and is consistent with management efforts for these species throughout their traditional range elsewhere.

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Introduction

Recent population declines of the northern long-eared (*Myotis septentrionalis*) and Indiana bat (*Myotis sodalis*), caused by the fungal pathogen *Pseudogymnoascus destructans* (white-nose syndrome [WNS]) have been extreme. Declines in the inland Northeast through the central and southern Appalachians have exceeded >90%, with the formerly common northern long-eared bat being largely absent in most of the landscape (Frick et al. 2016, Silvis et al. 2016, De La Cruz et al. 2018). Within the central Appalachians specifically, functional extirpation occurred rapidly with the infection of caves in karst areas of the High Appalachian Plateau where long hibernation periods occur (Johnson et al. 2013, Ford et al. 2016*a*, Austin et al. 2018). Due to this large multi-region decline, the northern long-eared bat was recently listed as threatened in the United States (U.S. Fish and Wildlife Service 2015) and endangered in Canada (Committee on the Status of Endangered Wildlife in Canada 2013). In addition to drastic additive mortality caused by WNS, juvenile recruitment among the residual population appears to have declined along the Appalachian Highlands of the mid-Atlantic (Francl et al. 2012, Reynolds et al. 2016), and maternity colonies in the Ridge and Valley and Blue Ridge of Virginia (VA) have experienced early-season colony collapse (Ford and Silvis 2017). Only within the lower Piedmont/upper Coastal Plain of VA and lower Coastal Plain of North Carolina (NC) (Grider et al. 2016, Kalen et al. 2017, Deeley et al. 2018), coastal Massachusetts (MA) (Dowling and O'Dell 2018), coastal New York (NY) (Gorman et al. 2020), and the Appalachian Plateau of West Virginia (WV) (De La Cruz et al. 2018) have colonies remained cohesive and reproduced successfully.

Once thought to only persist as far south and east as the Great Dismal Swamp, VA, research and monitoring efforts in eastern NC have revealed the presence of both successfully reproductive summer maternity colonies and overwintering populations of northern long-eared bats (Grider et al. 2016, Morris et al. 2009. G. Jordan, U.S. Fish and Wildlife Service, unpubl. data, K. Caldwell, North Carolina Wildlife Resources Commission, unpubl. data). Additionally, White et al. (2018) captured non-reproductive northern long-eared bats in Beaufort County, South Carolina (SC) during November 2016. Similarly, prior to 2014 the Indiana bat was assumed absent east of the Blue Ridge Mountains in VA and NC. However, St.Germain et al. (2017) documented Indiana bat reproduction on the northern Coastal Plain of VA, and Silvis et al. (2017) suggests presence of the species to the south near the VA/NC border. Accordingly, during 2017–2019, we targeted Coastal Plain sites in southeastern VA and northeastern NC to conduct long-term monitoring and targeted capture efforts to provide a more focal examination of the region. This report, while providing some comprehensive analyses, highlights work primarily conducted in NC. Our major objectives were to 1) identify sites where northern long-eared bats and/or Indiana bats were present; 2) describe habitat use/selection 3) examine effect of weather on activity levels/recorder nights in relation to season; 4) identify potential conservation needs to enhance management efforts in the region.

Study Area

We examined northern long-eared bat presence across 115,000 ha of the South Atlantic Coastal Plain in northeastern NC (Fig. 1). Acoustic data were collected at three United States Fish and Wildlife (USFWS) National Wildlife Refuges (NWR) in eastern NC (NC): Roanoke River NWR (8,500 ha), Pocosin Lakes NWR (45,000 ha), and Alligator River NWR (61,500 ha). East to west, these NWRs are largely located in the counties of Bertie, Tyrrell, and Dare,

respectively. Mist net sampling data were collected at Roanoke River and Alligator River NRWs and NC Wildlife Commission's North River Game Land located in Camden and Currituck counties, NC. Regional topography is characterized by a predominately flat alluvial plain ranging < 180 m in elevation near the Fall Line to sea level at the coast. The study area is approximately 44% forested (34% woody wetland) and receives 100–150 cm of precipitation during mid-summer (Hunter et al. 2001, Yang et al. 2018). Native upland forests are a southern mixed forest of oak (*Quercus* spp.)/hickory (*Carya* spp.)/pine (*Pinus* spp.), historically containing a large proportion of longleaf pine (*Pinus palustris*). On the Coastal Plain of North Carolina, much of the native pocosin and woody wetlands were converted to short-rotation pine plantations, largely planted loblolly pine (*Pinus taeda*), and agricultural fields. Alluvial woody wetlands of the Coastal Plan are primarily composed of water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), and bald cypress (*Taxodium distichum*), whereas non-alluvial wetlands often contain pond pine (*Pinus serotina*) and bays (*Persea* spp.). Mean temperature during the maternity season (June-August) is 26 °C and is 8 °C during the traditional hibernating season (November-February) (PRISM Climate Group 2004).

METHODS

Acoustic Recording

Deployment Location and Data Collection

Acoustic presence/absence surveys involved deployment of Song Meter SM2 ZC and Song Meter SM4 ZC (Wildlife Acoustics, Maynard, MA) recorders attached with SMM-U1 ultrasonic microphones. Recorders were programmed to record from sunset to sunrise relative to individual recorder location. Recorders were deployed near 1) forest-canopy openings; 2) water sources; 3) tree lines adjacent to large openings or that connect two larger blocks of forest; 4)

near potential roost trees; and 5) road and/or stream corridors with open tree canopies (Britzke et al. 2011). At *n* = 14 sites recorders were deployed: 1) ≥ 3 m in any direction from vegetation or other obstructions (Arnett and Hayes 2000, Weller and Zabel 2002, Chenger and Tyburec 2014); 2) in areas without, or with minimal, vegetation within 10 meters in front of the microphone; 3) parallel to woodland edges; and 4) at least 15 m from known or suitable roosts (e.g., trees/snags, buildings, bridges, bat houses, cave or mine portal entrances). Additionally, SMM-U1 ultrasonic microphones were elevated ≥ 1 m above ground level vegetation to gather the highest quality calls possible. Detectors were checked on 30–60 days intervals, and data were downloaded and returned to Virginia Tech for post-processing.

Acoustic sites were distributed within the respective NWRs as follows: Roanoke River *n* = 5 sites, *n* = 4 sites Pocosin Lakes NWR, and Alligator River NWR; *n* = 5 sites in northeastern NC. For all NWRs, mean distance between recording sites was $\overline{x}$ = 6 km (Table 1).

Analysis of Acoustic Data

The USFWS approved Kaleidoscope Pro (Version 4.5.5; Wildlife Acoustics, Maynard, MA[1]) was used to classify all files to species. Data were analyzed using the Bats of North America 4.2.0 package of Kaleidoscope set at "0" sensitivity (Ford 2017). Kaleidoscope examined the data for the presence of the following 12 species: Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), Seminole bat (*L. seminolus*), silver-haired bat (*Lasionycteris noctivagans*),

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southeastern bat (*M. austroriparius*), little brown bat (*M. lucifugus*), northern long-eared bat, Indiana bat, evening bat (*Nycticeius humeralis*), and tricolored bat (*Perimyotis subflavus*). Although the classifier may have returned a species-specific identification at the file level, following USFWS protocol (United States Fish and Wildlife Service 2019), presence was assumed during a night at a given recording station if a statistically significant maximum likelihood estimation (MLE; $P < 0.05$) that accounts for known rates of misclassification was produced.

Mist Netting

Net Locations

Netting at the three NWRs and the North River Game Land was conducted along potential travel corridors such as streams, trails, skid road, but also over road ruts and pond edges. Nets were placed perpendicular to corridors and filled the flyway from side-to-side and from ground level to forest canopy. We prioritized mist netting at known capture sites and near recordings stations that produced a significant MLE presence value for either northern long-eared or Indiana bats. Typically, sites contained a minimum of 3 pole sets of 1–3 stacked nets.

Checking Nets

Each net was checked approximately every 10 minutes with duration never exceeding 15 minutes. Noise and light were minimized, and all other disturbances were avoided when possible. The survey period began at sunset and continued for a minimum of 2–5 hours (Huebschman 2019).

Weather Conditions

Netting was suspended on a given night if weather conditions included 1) temperatures that fell below 10°C; 2) precipitation, including rain and/or heavy fog, exceeding 30 minutes; 3)

sustained wind speeds greater than 4 m/sec for 30 minutes or more. Netting was cancelled for personnel safety if lightning, or other dangerous inclement weather, was observed nearby.

To assess the impact of weather conditions (i.e., temperature (°C), relative humidity (%), precipitation (cm), and total hours of precipitation) specific to acoustic presence determinations, average nightly data (20:00–06:00) were downloaded from Iowa Environmental Mesonet and NC ASOS network (IEM 2019). Weather data were downloaded for 1 Jan 2018 to 31 August 2019. We examined the effect of weather conditions on both seasonal presence and activity levels across both VA and NC due to the increased statistical power of the sample (n = 63) and spatial distribution of weather stations.

Documentation and Processing of Captures

Captured bats were identified to species based on morphological characteristics (e.g., ear and tragus length, presence/absence of calcar, etc.) and overall appearance of the animal (Menzel et al. 2002). Documentation of capture site, date of capture, time of capture, sex, reproductive condition, age, weight, right forearm measurement, band number and type (if applicable), and Reichard's wing damage index score was recorded for each bat captured (Reichard and Kunz 2009). Age of bats was determined by examining epiphyseal-diaphyseal fusion (i.e., calcification; adult vs. juvenile) of long bones in the wing. Length of the right forearm of each bat was measured to the nearest 1.0 mm using a metric ruler. Weight was measured to 0.25 grams using a Pesola spring scale (© PESOLA AG, Switzerland). The reproductive condition of captured bats was classified as non-descended male, descended male, non-reproductive female, pregnant female (based on gentle abdominal palpation), lactating female, or post-lactating female. Bat processing and data collection typically was completed within 15 minutes.

The sex, reproductive condition, and GPS coordinates of captured northern long-eared bats were provided to the UFWS NC Field Office and NC Wildlife Resources Commission. Representative photo-documentation of captured northern long-eared are included as evidence of proper field identification. Photo-documentation included diagnostic characteristics, specifically a 3/4-view of the face showing ear, tragus, and muzzle.

Radio-tracking, Roost Documentation, and Home Range Analysis

Captured adult and reproductively active (i.e., pregnant, lactating, post-lactating) female northern long-eared bats were affixed with radio transmitters. The radio transmitter, adhesive, and any other markings (e.g., wing bands) complied with USFWS and state permits, weighed less than 5% of pre-attachment body weight (Sikes and Gannon 2011), and did not weigh more than 10% of a bat's total body weight (Kurta and Murray 2002). Due to weight ratio limitations, transmitters were not attached to juvenile bats. All radio-tagged bats were tracked to diurnal roosts using TRX-1000WR tracking receivers (Wildlife Materials, Murphysboro, IL). Tracking was conducted for 7 days or until transmitters fell off or died/malfunctioned. Radio telemetry searches for day roosts were conducted until the bat(s) were located or for a minimum of 4 hours of ground effort for each tagged bat; bats were tracked simultaneously.

For each roost identified during tracking, a Virginia Tech "Bat Roost Tree Measurement Sheet" was completed. Following the methods of Silvis et al. (2012), data collected at each roost included: tree species, diameter at breast height (DBH), canopy class (i.e., 1= emergent, 2 = dominant, 3 = midstory, 4 = suppressed), height, decay stage (i.e., 1= alive, 2 = declining, 3 = dead, 4 = loose bark), roost type (i.e., cavity or bark), height to roost feature, canopy closure at cardinal directions, percent bark remaining, and basal area (20 factor prism). Similar data from neighboring non-roost trees were collected (e.g., species, height, DBH) to characterize the forest

near roost trees and to allow for comparison of used trees to those readily available for potential use as roosts.

Home range estimates were constructed using the Gaussian, fixed kernel method, with plug-in estimator for the smoothing parameter (*h*), in the program Geospatial Modeling Environment (GME, version 0.7.4.0) using the function *kde*; we constructed 50% and 95% utilization distributions (UD) using the function *isopleth* (David et al. 2012, Beyer 2015). Additional roost data (n = 20) provided by VHB Ecological Engineering (D. Brown, Raleigh, NC; unpubl. data) were included in home range estimates but were not included in roost analysis of roost characteristics due to differences in data collection.

Landscape Associations

Following De La Cruz et al. (2018), to assess habitats near acoustic sites and within home ranges, distance to land-cover types and forest fragments was recorded. Distance was defined as the Euclidean distance from areas of interest to the nearest feature as measured with the Joins and Relates tools of ArcGIS (version 10.3; ESRI, Inc., Redlands, CA). Distance measures were based on random and stratified random points generated around acoustic sites (n = 14 - 5 km buffers; n = 1000 per buffer) and within 50% UD (n = 100) and 95% UD (n = 200) home ranges, and the 2.5 km regional buffer (n = 2500) around the home ranges. Random and stratified random points were created using the functions *genrandompnts* and *genstratrandompnts* in GME (Beyer 2015).

We used 2016 National Land Cover Data (NLCD) to characterize land-cover surrounding acoustic sampling sites (Yang et al. 2018). However, due to the finer spatial scale, habitats within home ranges, and the surrounding regional buffer, we used the Image Classification extension within Spatial Analyst to extract land-cover classes from aerial imagery provided by

the 2018 National Agriculture Imagery Program (NAIP; U.S. Department of Agriculture 2018). We utilized a supervised, maximum-likelihood classification to create 7 cover-classes: woody wetlands, mixed upland forests, barren/crop, herbaceous/crop, developed/road, open water, and canopy breaks (De La Cruz et al. 2018, Dewan and Yamaguchi 2009).

Based on NLCD data, we examined forest fragmentation (i.e., forest or non-forest) using the Landscape Fragmentation Tool of ArcGIS and classified forest fragmentation into 4 primary categories: patch (forest fragments degraded by edge effect), edge (forest periphery degraded by edge effect), perforated (interior forest edge), and core forest (forest area not degraded by edge effect). We further classified core forest as small (<100 ha), medium (100–200 ha), or large (>200 ha) (De La Cruz et al. 2018, Vogt et al. 2007).

Statistical Analysis

To assess the seasonal effect of weather (e.g., temperature and precipitation) and landscape variables (e.g., landcover and fragmentation) on the presence and activity levels of northern long-eared and Indiana bats from acoustic recordings, we fit generalized linear mixed-effect (recording station and year) models ranked by AIC (Patriquin et al. 2016). We assessed significance of individual parameters within the best-supported model by using Wald's chi-square test, and overall fit of the model by using the log-likelihood–ratio test against a null model as well as the area under the receiver operating characteristic curve (AUC).

To compare characteristics (i.e., DBH, height, crown class, and decay stage) between roosts of radio-tracked northern long-eared bats and those of neighboring non-roost trees, we fit global, binomial, generalized linear models that incorporated all variables, ranked by Akaike's information criterion (AIC), using a stepwise procedure on bootstrap samples (n = 1000) of the data (De La Cruz et al. 2018). Rather than compare a suite of intuitive models, this method

investigates variability of model selection via data simulation–model refit using simulated data and the application of the stepAIC algorithm to the refitted model(s) to find the best-supported model (Dunn et al. 2010, Stepper et al. 2015). We employed a chi-square goodness-of-fit test to determine if neighboring trees and trees used by Northern Long-eared Bats were uniformly distributed by species and roost type (i.e., cavity, loose bark). We analyzed habitat selection within the region (95% UD within 2.5 km) and selection within the roosting home range (50% UD within 95% UD) using a quadratic discriminant functional analysis, evaluating significance of individual parameters using a MANOVA and overall fit of models by classification matrix (i.e., predicted vs actual) and AUC.

We conducted all statistical analyses in RStudio (version 1.2.5001, RStudio, Inc., Boston, MA) and all tests were performed using $\alpha \leq 0.05$ to determine significance.

RESULTS

Acoustic Recording

Acoustic Recording Effort and Total Bat Calls

Specific to the 14 acoustic recorders located in NC, a total 502,267 files were recorded over 1,339 recorder nights (30 April 2018–14 August 2019), and from these data Kaleidoscope identified 125,261 files (25%) to species. Tricolored bats were the most commonly recorded species (32,485; 26%), followed by the Seminole bat (22,784; 18%), silver-haired bat (15,770; 13%), hoary bat (10,640; 9%), little brown bat (10,496; 8%), big brown bat (10,421; 8%), evening bat (10,329; 8%), red bat (6,587; 5%), southeastern bat (3,218; 3%), Indiana bat (1,364; 1%), northern long-eared bat (1,110; 1%), and Rafinesque's big-eared bat (57; <1%) (Table 2).

Acoustic Presence of Threatened and Endangered Bats

Only at AR-03 (Alligator River) were no potential calls of either the northern long-eared or Indiana bat recorded; it should be noted that AR-03 was destroyed sometime after 30 May 2018 and produced only 22 recorder nights of data. Both species were recorded nearly equally throughout the sample period, with 1,110 (northern long-eared) and 1,364 (Indiana bat) recordings collected across all sites (Table 2). Of the 14 total acoustic sampling sites, Indiana bats, via a statistically significant MLE, appear likely present at some point in the year at 11 (79%) recording sites. Similarly, northern long-eared bats also appear likely present at 11 recording sites, however, presence of the two species overlapped only at 8 sites: AR-01, AR-05, PL-03, PL-04, RR-01, RR-02, RR-05, and RR-06 (Table 3). Northern long-eared bats were recorded most often and appeared likely present during 50 recorder nights (39%) at AR-05; AR-05 is a known capture location of the species. Indiana bats were recorded most often and appeared likely present during 41 recorder nights at RR-06 (58%) (Table 3); no capture effort was conducted at RR-06.

Seasonally, northern long-eared bat activity begins to increase in mid- to late-February, is highest between early April through mid-May, and declines steadily thereafter (Fig. 2). Unlike northern long-eared bats, Indiana bat activity appears to peak in late-March and declines precipitously thereafter (Fig. 3). These results suggest a more prolonged presence of northern long-eared bats on the spring and summer landscape than Indiana bats and may suggest more wide-spread reproduction; whereas, Indiana bats may primarily use the region as a winter refugia.

Weather during spring affected activity levels of northern long-eared bats (Table 4, Fig. 4). Specifically, as temperatures rise bats become more active, but that activity is depressed with

the inclusion of high winds and precipitation. In summer northern long-eared bat activity was depressed by excessive heat and rising humidity, but also with increases in wind speeds (Table 5, Fig. 5). During winter, northern long-eared bats were more active during warm, humid and breezy nights; however, similar to spring, precipitation dampened activity (Table 6, Fig. 6). Due to a lack northern long-eared bat recordings, no analysis specific to fall weather was conducted.

Unlike northern long-eared bats, Indiana bats appeared more active at cooler temperatures and during short periods of precipitation in the spring (Table 7., Fig. 7). During summer, Indiana bat activity was highest during dry and calm nights of high relative humidity (Table 8, Fig. 8). Similar to spring, Indiana bat activity during fall was highest during cooler and breezy nights of high relative humidity, but with little or no precipitation (Table 9, Fig. 9). Finally, during winter, Indiana bat activity was highest during warmer and more humid nights, but with little or no precipitation (Table 10, Fig. 10).

Mist Netting

Bat Captures

During 88 net nights of sampling, 134 bats were captured across the study area during 2018 and 2019. Evening bats were the most frequently captured bats (*n* = 33; 25%), followed by southeastern bats (*n* = 26; 19%), red bats (*n* = 22; 16%), Rafinesque's big-eared bats (*n* = 19; 14%), big brown bats (*n* = 16; 12%), northern long-eared bats (*n* = 12; 9%), tricolored bats (*n* = 5; 4%), and a single Seminole bat (<1%) (Table 11).

Roanoke River NWR accounted for most captures (*n* = 63; 47%), followed by North River Game Lands (*n* = 40; 30%) and Alligator River (*n* = 31; 23%). Evening bats were captured at all sites but at very low numbers at Roanoke River (*n* = 2). No southeastern bats were captured at Alligator River, whereas 22 were captured at Roanoke River and four at North River Game

Lands. Red bats were captured at similar numbers from all tracts. Similar to southeastern bats, Rafinesque's big-eared bats were not captured at Alligator River, but 15 bats were captured from Roanoke River and four from North River Game Lands. Big brown bats were captured at all sites; however, big brown bats appear more concentrated at Roanoke River accounting for 56% of all captures. The range of the northern long-eared bat appears most restricted across the study area and nearest the coast, with captures exclusive to North River Game Land. Tricolored bats were captured at low numbers from all tracts. A single female Seminole bat was captured at Alligator River; the study area lies near the northern extent of the species range (Perry 2018).

Captures of Threatened and Endangered Bats

Northern long-eared bats were captured during 17 June–28 June 2019 at North River Game Lands. Northern long-eared bats comprised 9% of all captures but were only captured at North River Game Lands. However, the majority of northern long-eared bats captured were reproductive, adult female bats (58%; lactating = 6, post-lactating = 1), followed by four juvenile bats (33%; male = 3, female = 1) and only one (8%) non-reproductive adult male. All captured adult females were found to be suitable from a weight perspective for radio-tracking and were fitted with transmitters to locate day roosts. Additionally, wing-punch samples were taken from captured northern long-eared bats for later DNA analysis across the entire mid-Atlantic region. No Indiana bats were captured.

Located Roost Trees and Roost Selection

A total of 15 roost trees comprised of six species were located at North River Game Lands (Table 12). Trees used as diurnal roosts by northern long-eared bats include: water tupelo (*Nyssa aquatica*) (*n* = 5, 33%), Carolina ash (*Fraxinus caroliniana*) (*n* = 3, 20%), red maple (*Acer rubrum*) (*n* = 2, 13%), swamp bay (*Persea palustris*) (*n* = 2, 13%), sweetgum

(*Liquidambar styraciflua*) (*n* = 2, 13%), and American holly (*Ilex opaca*) (*n* = 1, 7%). Most northern long-eared bats roosted in cavities (*n* = 15; 73%), with only four (27%) found roosting under exfoliating bark. No tree species (χ^2 = 2.73, df = 6, *P* = 0.84) or roost type (χ^2 = 0.26, df = 1, *P* = 0.61) was used more than expected based on availability. The largest emergence count (*n* = 3) suggest that no roost tree located was used as a primary maternity colony roost and that the primary parturition/early lactation pre-volancy period had passed.

The best-supported model differentiating roost characteristics at the 15 located roost trees used by northern long-eared bats from 60 neighboring non-roost trees contained roost height, crown class, and decay stage (Table 13, Fig. 11). Under this model, probability of roost occupancy is highest in mid-story and suppressed trees, specifically decaying (i.e., dead trees) trees < 9 m tall. This model provided a better fit than the null model (log-likelihood = -37.53, df = 7, *P* = 0.002) and displayed moderate predictive power (AUC = 0.83).

Landscape Associations

Acoustics

Probability of northern long-eared presence increased with decreasing proximity to deciduous and evergreen forests but increased with increasing distance from areas of mixed and woody wetland forests (Table 14; Fig. 12). This model provided a better fit than the null model (log-likelihood = -167.16, df = 4, *P* < 0.001) and displayed moderate predictive power (AUC = 0.89). Similarly, probability of Indiana bat presence increased with decreasing distance to deciduous forests but also woody wetland forests. Additionally, probability of Indiana bat presence increased with increasing distance from evergreen and mixed forests (Table 15; Fig. 13). This model provided a better fit than the null model (log-likelihood = -109.88, df = 4, *P* < 0.001) and displayed moderate predictive power (AUC = 0.90).

Home Range Estimates

Based on *n* = 35 roost trees, 50% UD and 95% UD roosting home ranges were 11.3 ha and 43.6 ha (Fig. 14), respectively. Additional roost data (*n* = 20) provided by VHB Ecological Engineering (D. Brown, Raleigh, NC; unpubl. data) were included in home range estimates.

Core home range within a periphery habitat selection suggests that northern long-eared bats select for areas farther from forest edges, non-forest areas, and large forest perforations. Overall model accuracy was fair at 80% and displayed moderate predictive power (AUC = 0.90; Fig. 14; Table 16). Similarly, selection of habitat comparing the peripheral home range to the region within a 2.5 km buffer suggests selection of areas nearer large core upland and woody wetlands containing small canopy breaks. The overall accuracy of this model was high 92% and displayed strong predictive power (AUC = 0.98; Fig. 14; Table 17).

DISCUSSION

Few data regarding probable presence, activity levels, and habitat selection of northern long-eared and Indiana bats on the Coastal Plain are available, and their use of these regional habitats have been rarely or only cursorily documented (Morris et al. 2009, Grider et al. 2016, St.Germain et al. 2017, White et al. 2018). Our results support the findings of previous research that northern long-eared bats do use the Coastal Plain of NC both as maternity habitat and winter refugia, and, despite no captures, our acoustic recording efforts suggest the likely presence of Indiana bats in the region.

Nonetheless, acoustic recordings of the northern long-eared and Indiana bats were low and likely reflect either the decline of these species post-WNS (Frick et al. 2010) or a general rarity and patchy distribution in the area. Northern long-eared bats were recorded most often and

appeared likely present at Alligator River NWR, a known capture location of the species, and Indiana bats were recorded most often and appeared likely present at Roanoke River NWR. Due to the likely presence determinations, these NWRs are of high conservation value and necessitate additional research effort to better understand current distribution/habits of these therein.

Seasonally, northern long-eared bat activity is highest and most consistent during spring, whereas Indiana bat activity appears to peak in late-March and declines quickly. These results alone suggest use of the Coastal Plain by northern long-eared bats during maternity season, while Indiana bats appear to primarily use the region as a winter refugia; use as winter refugia may explain the lack of Indiana bat captures during spring and summer. Additionally, the Coastal Plain of southeastern VA and northeastern NC may serve as the over-wintering grounds for the Indiana bats of St.Germain et al. (2017) located at Fort A.P. Hill Military Reservation in Caroline County, VA, along the Piedmont-Coastal Plain Fall Line. Despite population declines post-WNS (Frick et al. 2010, Silvis et al. 2016) of little brown and tricolored bats (Dzal et al. 2011, Powers et al. 2015), our results still suggest wide-ranging presence on the Coastal Plain. However, due to the plasticity of red bat calls, acoustic call totals related to the Seminole bat, specifically, but also the little brown bat and to a lesser degree Indiana bats, should be viewed with caution (Nocera et al. 2019).

Northern long-eared bats were only captured at North River Game Land, supporting the hypothesis of current population localization, specifically nearer the coast of NC and VA (Silvis et al. 2017, De La Cruz et al. 2018, Jordan 2019). Similar to research conducted in the mid-Ohio Valley of Kentucky (KY), the central Appalachians of West Virginia, and the Piedmont and Coastal Plain of VA, northern long-eared bats at North River Game Land roosted in dense canopy forests and in small, suppressed trees that receive little direct sunlight (Deeley et al.

2018, De La Cruz et al. 2018, Johnson et al. 2012, Kalen et al. 2017, Lacki and Schweirjohann 2001, Menzel et al. 2002, Silvis et al. 2012). Congruent with the findings of Silvis et al. (2012) and Patriquin et al. (2017) from KY, northern long-eared bats in coastal NC use shorter and highly decayed (i.e., dead with loose bark) roost trees, behavior likely linked to the hot and humid nature of the region. While reproduction of northern long-eared bats was well documented (i.e., presence of juveniles, lactation), emergence counts were low, seemingly due to early juvenile volancy (Silvis et al. 2014). This early volancy may be due to accelerated fetal development caused by high ambient temperatures relative to the core of the species range (Willis et al. 2006) and has been observed in residual northern long-eared bats in the District of Columbia (S. Deeley, pers. comm).

Our results support the observations of others that northern long-eared bats require reasonably large areas of contiguous forest for both roosting and foraging (Sasse and Pekins 1996, Lacki and Schweirjohann 2001, Carter and Feldhamer 2005, Broders et al. 2006, Perry and Thill 2007, Henderson and Broders 2008, De La Cruz et al. 2018). The 50% and 95% UD roosting home range estimates from North River Game Land are similar to those observed in other areas of large, contiguous forest (Owen et al. 2003, Silvis et al. 2012). Conservation practices on the Coastal Plain should take into consideration that home range size tends to increase with poor resource quality and/or availability and can vary between core and peripheral populations with respect to first-order selection (Dussault et al. 2005, Koprowski et al. 2008).

Measures of canopy closure indicate that northern long-eared bats use suppressed and shaded trees that receive little direct sunlight (Lacki and Schweirjohann 2001, Menzel et al. 2002*b*, Johnson et al. 2012, Silvis et al. 2012). Patriquin et al. (2017) defines the upper thermoneutral zone of northern long-eared bats as 30 °C, and as temperatures approached this

threshold across eastern NC, northern long-eared bat activity decreased sharply. The highly shaded roosts used at North River Game Land may be in response to the extreme summer temperatures of the region. However, research has also shown that northern long-eared bats select forests frequently altered by small-scale disturbances, alterations that, while not stand-replacing, create more roosts and enhance the quality (i.e., increased solar exposure, exfoliating bark) of existing roosts available for use (Johnson et al. 2009, Ford et al. 2016*a*, *b*). Our results demonstrate both the use of suppressed and shaded roost trees but also the selection of small-scale disturbances (i.e., canopy breaks < 100 m in diameter) that promote increased solar radiation. Northern long-eared bats at North River Game Land selected for roosting areas in woody wetlands, but these areas were nearer to dry upland areas than random. Although trees readily establish or regenerate in this wetland/upland interface, the fluctuating water regime and overall high canopy cover stresses, promotes rot, and causes mortality of trees. Similar to the processes described by Silvis et al. (2012), it may be that the dynamic forces located within this habitat interface promotes the continual creation of natural roosts and the variety of conditions necessary for use by northern long-eared bats seasonally. These results suggest a requirement for the juxtaposition of woody wetland roosting areas with upland forest foraging areas, and the heterogeneous resources created at the overlapping edge of these habitats locally.

Recently, reproductively successful colonies have been documented on the Western Allegheny Plateau of WV (De La Cruz et al. 2018), the North Atlantic Coast of NY (Barr et al., 2018, Virginia Tech, unpubl. data), and the Chesapeake Bay Lowlands of Washington D.C. (Deeley et al. 2018). These populations may demonstrate persistence due to little or no exposure to WNS via use of unique hibernacula, and therefore lack of exposure to WNS-vectoring species such as little brown bats, latitudinal migration (i.e., non-hibernation), or a combination of both

alternative hibernacula and over-wintering coastal habitats. As more northern long-eared bat colonies collapse and recruitment fails (Francl et al. 2012, Reynolds et al. 2016), particularly those populations associated with traditional karst hibernacula of the Appalachians, an understanding of why the species persists and successfully reproduces in isolated pockets of its range will be critical for the conservation of the species. Current research suggests that the mild climate along the Fall Line of VA (Kalen et al. 2017), and of the Coastal Plain of VAs and northeastern NC, allows the species to persist on the landscape year-round, albeit perhaps at lower densities relative to pre-WNS, thus behaviorally avoiding WNS-impacted hibernacula completely (Grider et al. 2016, Ford and Silvis 2017, Deeley et al. 2018). Additionally, recent findings suggest that the use of unique, non-traditional hibernacula (i.e., basements, coal adits) may allow the species to avoid long-term exposure to WNS in colder regions where northern long-eared bats still persist (De La Cruz and Schroder 2015, Dowling and O'Dell 2018).

Indiana bats often select roosting habitats in close proximity to foraging sites and generally selects forests of similar structure throughout their range (i.e., forests containing large diameter trees with sloughing bark, crevices and/or cavities) (Jachowski et al. 2014), suggesting that results here may provide some insight into roosting habitat in the region despite the lack of physical capture (De La Cruz and Ward 2016). The use of large tracts of forests, displaying closed to semi-open canopies, likely provides a more diverse range of roost trees and foraging habitats available to colonies (Humphrey et al. 1977, Laval and Laval 1980, Brack 1983, Callahan 1993, Ford et al. 2005), and such forests have been shown particularly important to the species in areas of high agricultural development (Womack et al. 2013, Jachowski et al. 2014). Similar to the mixed composition of forests found at North River Game Land and across much of the study area, Britzke et al. (2003) documented the use of mixed upland (i.e., pine/hardwood)

forests by Indiana bats in western NC and eastern Tennessee (TN). The positive relationship between recorder nights and deciduous forests and woody wetlands here suggests the need to conserve large and diverse tracts as foraging and roosting habitat in eastern NC. Humphrey et al. (1977) demonstrated that Indiana bats foraged exclusively in riparian forests. The wide availability of alluvial bottomland throughout the study area may concentrate insect populations, thus providing a diverse and abundant forage base to Indiana bats (Menzel et al. 2005). In addition to being potential foraging and roosting habitats, the alluvial bottomland forests of the Roanoke River, Chowan River, Perquimans River, Little River, Pasquotank River, North River, Northwest River, and North Landing River may serve as regional travel corridors between over-wintering sites in NC and maternity areas to the north in VA and beyond (Menzel et al. 2005). The negative relationship between activity and temperature, lack of capture, and peak of activity in mid-March observed during this research, suggests the region is likely not used in the formation of maternity colonies but potentially as winter refugia.

Our findings provide a regional assessment of probable presence, activity levels, and habitat selection of northern long-eared and Indiana bats on the Coastal Plain and can be used to identify candidate areas for conservation planning in NC and VA. Conservation efforts regarding both northern long-eared and Indiana bats should be focused in large tracts (> 200 ha) of contiguous deciduous upland and woody wetland forest cover. Specific to northern long-eared bats, large contiguous woody wetlands adjacent to tracts of upland deciduous forest, and that contain small, cavity bearing and/or dead trees, should be conserved for both foraging, the formation of maternity colonies, and over-wintering. Regionally, future research should again focus on capture of Indiana and northern long-eared bats during deep winter. For example, RR-06 should be netted for the capture of Indiana bats to facilitate tracking and identification of roost

use and habitat selection, and such efforts would also help to confirm or disprove the presence of Indiana bats in the region. Although survey effort exceeded USFWS guidelines for accepted presence using acoustic techniques, results here demonstrate the likely presence of Indiana bats on the Coastal Plain of NC rather than an unquestionable record. Conservation efforts are more effective when based upon information collected at a local level (De La Cruz and Ward 2016), and our results address conservation priorities of both summer foraging and roosting home range/habitat selection, particularly for the threatened northern long-eared bat.

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TABLES

Table 1. Acoustic recorder locations, survey dates, and number of recorder nights collected from three USFWS NWRs in Bertie, Tyrrell, and Dare counties, NC, 2018–2019.

Tract	Site	Latitude	Longitude	Survey Dates	Recorder Nights
Alligator River	AR-01	35.82534	-75.89526	5/18 – 8/18; 2/19; 4/19 – 5/19	75
	AR-02	35.80086	-75.84803	5/18 – 8/18; 2/19; 4/19 – 7/19	128
	AR-03	35.79565	-75.88512	5/18 – 5/30	22
	AR-04	35.78212	-75.90149	5/18 – 5/18; 11/18; 4/19 – 5/19	32
	AR-05	35.82958	-75.90258	6/18; 8/18 – 8/19	236
Pocosin Lakes	PL-01	35.76384	-76.26382	5/18 – 8/18; 11/18; 2/19; 4/19 – 7/19	175
	PL-02	35.74665	-76.26725	5/18; 8/18 – 9/18; 2/19; 4/19 – 7/19	92
	PL-03	35.7434	-76.32426	5/18 – 8/18; 11/18; 2/19; 5/19	57
	PL-04	35.70845	-76.34125	5/18 – 8/18; 11/18; 2/19; 4/19 – 6/19	101
Roanoke River	RR-01	35.97368	-77.16498	4/18 – 8/18	87
	RR-02	35.9695	-77.14152	4/18 – 8/18	68
	RR-03	35.96429	-77.14864	6/18 – 8/18	45
	RR-05	35.90211	-77.01897	4/18 – 8/18; 11/18; 2/19; 4/19 – 6/19	104
	RR-06	35.89753	-77.00919	4/18 – 8/18; 11/18; 2/19; 3/19 – 4/19	127

Table 2. Total number of calls per recording site (*n* = 14) as identified by Kaleidoscope Pro (v. 4.2.0) from three USFWS NWRs in Bertie, Tyrrell, and Dare counties, NC, 2018–2019.

Tract	Site	CORA	EPFU	LABO	LACI	LANO	LASE	MYAU	MYLU	MYSE	MYSO	NYHU	PESU
Alligator River	AR-01		720	235	1020	3115	1665	73	416	9	24	181	1507
	AR-02		2142	279	87	1024	1686	13	183	21	23	462	449
	AR-03		66	79	72	317	377	3	111			41	246
	AR-04	2	2033	263	76	540	2157	5	149	10	2	1783	287
	AR-05	43	3732	1856	2282	1329	3240	221	2255	283	66	4472	20364
Pocosin Lakes	PL-01	2	312	1482	223	729	5923	133	3178	153	34	755	3376
	PL-02	1	179	282	753	477	1708	141	405	33	9	299	488
	PL-03		16	415	11	9	26	120	629	26	33	188	1648
	PL-04		63	203	1068	3375	1864	23	235	11	20	171	517
Roanoke River	RR-01		26	155	175	264	2396	20	72	3	11	66	1266
	RR-02	3	64	243	6	25	81	53	401	9	49	126	469
	RR-03		76	125	40	20	276	17	203	5	24	244	353
	RR-05	5	790	450	423	622	1240	1022	1019	168	225	1371	1436
	RR-06	1	202	520	4404	3924	145	1374	1240	379	844	170	79
Grand Total		**57**	**10421**	**6587**	**10640**	**15770**	**22784**	**3218**	**10496**	**1110**	**1364**	**10329**	**32485**

CORA = *C. rafinesquii*; EPFU = *E. fuscus*; LABO = *L. borealis*; LACI = *L. cinereus*; LANO = *L. noctivagans*; LASE = *L. seminolus*; MYAU = *M. austroriparius*; MYLU = *M. lucifugus*; MYSE = *M. septentrionalis*; MYSO = *M. sodalis*; NYHU = *N. humeralis*; PESU = *P. subflavus.*

Table 3. Total recorder nights of likely presence ($P < 0.05$) and total calls of northern long-eared and Indiana bats at three USFWS NWRs in Bertie, Tyrrell, and Dare counties, NC, 2018–2019.

Species		**Site**	**Recorder Nights**	**Total Calls**
Northern long-eared	Alligator River	AR-01	6	12
		AR-04	2	4
		AR-05	50	220
	Pocosin Lakes	PL-01	19	108
		PL-02	3	22
		PL-03	2	8
		PL-04	2	3
	Roanoke River	RR-01	1	1
		RR-02	3	5
		RR-05	9	133
		RR-06	31	283
Sub-total			**128**	**799**
Indiana bat	Alligator River	AR-01	1	3
		AR-02	3	6
		AR-05	2	8
	Pocosin Lakes	PL-03	2	7
		PL-04	2	12
	Roanoke River	RR-01	1	2
		RR-02	3	17
		RR-03	1	2
		RR-05	15	132
		RR-06	41	767
Sub-total			**71**	**956**

Table 4. Parameters and summary of model describing the influence of weather regarding nightly activity levels of northern long-eared bats (*Myotis septentrionalis*) on the Coastal Plain of NC and VA during spring, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	39.43	<0.01
Humidity	1	1.13	0.29
Wind	1	15.58	<0.01
Precipitation	1	5.95	0.01
Hours of Precipitation	1	0.04	0.85
Model	Log-likelihood	P > X^2	AUC
MYSE ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Years) + (1|Station)	-1127.3	<0.01	0.84

Table 5. Parameters and summary of model describing the influence of weather regarding nightly activity levels of northern long-eared bats (*Myotis septentrionalis*) on the Coastal Plain of NC and VA during summer, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	35.79	<0.01
Humidity	1	6.87	<0.01
Wind	1	11.19	<0.01
Precipitation	1	0.16	0.69
Hours of Precipitation	1	2.02	0.15
Model	Log-likelihood	P > X^2	AUC
MYSE ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Station)	-260.79	<0.01	0.81

Table 6. Parameters and summary of model describing the influence of weather regarding nightly activity levels of northern long-eared bats (*Myotis septentrionalis*) on the Coastal Plain of NC and VA during winter, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	11.37	<0.01
Humidity	1	15.9	<0.01
Wind	1	42.65	<0.01
Precipitation	1	2.84	0.09
Hours of Precipitation	1	11.43	<0.01
Model	Log-likelihood	P > X^2	AUC
MYSE ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Station)	-232.06	<0.01	0.88

Table 7. Parameters and summary of model describing the influence of weather regarding nightly activity levels of Indiana bats (*Myotis sodalis*) on the Coastal Plain of NC and VA during spring, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	9.06	<0.01
Humidity	1	1.96	0.16
Wind	1	1.56	0.21
Precipitation	1	31.53	<0.01
Hours of Precipitation	1	13.28	<0.01
Model	Log-likelihood	P > X^2	AUC
MYSO ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Years) + (1|Station)	-4090.0	<0.01	0.81

Table 8. Parameters and summary of model describing the influence of weather regarding nightly activity levels of Indiana bats (*Myotis sodalis*) on the Coastal Plain of NC and VA during summer, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	0.64	0.42
Humidity	1	194.70	<0.01
Wind	1	74.95	<0.01
Precipitation	1	21.26	<0.01
Hours of Precipitation	1	14.95	<0.01
Model	Log-likelihood	P > X^2	AUC
MYSO ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Years) + (1|Station)	-2564.6	<0.01	0.92

Table 9. Parameters and summary of model describing the influence of weather regarding nightly activity levels of Indiana bats (*Myotis sodalis*) on the Coastal Plain of NC and VA during fall, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	464.40	<0.01
Humidity	1	80.72	<0.01
Wind	1	9.73	<0.01
Precipitation	1	6.95	<0.01
Hours of Precipitation	1	0.25	0.62
Model	Log-likelihood	P > X^2	AUC
MYSO ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Years)	-6206.1	<0.01	0.82

Table 10. Parameters and summary of model describing the influence of weather regarding nightly activity levels of Indiana bats (*Myotis sodalis*) on the Coastal Plain of NC and VA during winter, 2017–2019.

Variable	DF	Wald X^2	P > X^2
Temperature	1	175.86	<0.01
Humidity	1	103.43	<0.01
Wind	1	1.65	0.20
Precipitation	1	8.04	<0.01
Hours of Precipitation	1	1003.22	<0.01
Model	Log-likelihood	P > X^2	AUC
MYSO ~ Temp + Humidity + Wind + Precipitation + Hours of Precipitation + (1|Station)	-1999.5	<0.01	0.84

Table 11. Bats captured from sample sites located in Bertie, Currituck, Tyrrell, and Dare counties, NC, 2018–2019.

Site	Long	Lat	Scientific Name	Apr	May	Jun	Aug	Apr	May	Jun	Total
				2018				2019			
Alligator River											
Site 01	-75.90267	35.82944	EPFU			1	1		1		3
			LABO			1	3		2		6
			LASE				1				1
			NYHU			8	11		1		20
			PESU				1				1
North River Game											
Site 01	-76.00725	36.38263	CORA							4	4
			EPFU							4	4
			LABO							3	3
			MYAU							4	4
			MYSE							12	12
			NYHU							11	11
			PESU							2	2
Roanoke River											
Site 01	-77.14166	35.96985	CORA		8						8
			LABO	4	1						5
			MYAU		13						13
			NYHU	1							1
Site 02	-77.16503	35.9734	CORA		7						7
			EPFU		1						1
			LABO		6			1			7
			MYAU		7			1			8
			NYHU		1						1
			PESU		1						1
Site 03	-77.02264	35.9037	MYAU		1						1
Site 05	-77.10665	35.93336	EPFU						8		8
			LABO						1		1
			PESU						1		1
Grand Total				**5**	**46**	**10**	**17**	**2**	**14**	**40**	**134**

CORA = *C. rafinesquii*; EPFU = *E. fuscus*; LABO = *L. borealis*; LACI = *L. cinereus*; LANO = *L. noctivagans*; LASE = *L. seminolus*; MYAU = *M. austroriparius*; MYLU = *M. lucifugus*; MYSE = *M. septentrionalis*; MYSO = *M. sodalis*; NYHU = *N. humeralis*; PESU = *P. subflavus.*

Table 12. Northern long-eared bat (*Myotis septentrionalis*) roosts located at Norther River Game Lands, Currituck County, NC, 2019.

Roost	Lat	Long	Species	DBH (cm)	Canopy Class[1]	Total Height (m)	Decay Class[2]	Roost Type	Roost Height (m)	Avg. Canopy Closure (%)	Bark Remaining (%)	Basal Area (20 factor)
140_01	36.37952	-76.01038	*Liquidambar styraciflua*	23.2	3	7	4	Bark	5	97	75	12
549_01	36.37998	-76.01226	*Acer rubrum*	6.2	4	4	1	Cavity	2	98	100	11
549_02	36.37966	-76.01023	*Nyssa aquatica*	9.5	4	5	1	Cavity	2	97	100	16
549_03	36.38048	-76.01128	*Persea palustris*	18.5	2	9	2	Cavity	2	80	100	8
590_01	36.37968	-76.01054	*Nyssa aquatica*	13.5	3	8	1	Cavity	4	95	100	9
590_02	36.3799	-76.01086	*Persea palustris*	12.6	3	9	2	Cavity	5	91	100	13
706_01	36.37952	-76.01196	*Fraxinus caroliniana*	9	3	9	3	Cavity	1	95	100	13
706_02	36.38113	-76.00761	*Fraxinus caroliniana*	13.2	3	6	4	Bark	5	76	40	8
706_03	36.38092	-76.00749	*Acer rubrum*	18.8	3	8	4	Bark	5	92	60	9
745_01	36.38006	-76.00979	*Fraxinus caroliniana*	11.1	4	5	1	Cavity	1	96	100	9
745_02	36.37965	-76.00806	*Ilex opaca*	13	4	6	3	Cavity	2	96	100	7
786_01	36.38098	-76.01336	*Nyssa aquatica*	8.3	3	8	1	Cavity	1	97	100	16
909_01	36.38115	-76.0063	*Liquidambar styraciflua*	13	3	8	4	Bark	6	96	75	7
909_02	36.38141	-76.00948	*Nyssa aquatica*	12.5	2	11	1	Cavity	4	97	100	16
909_03	36.38076	-76.00802	*Nyssa aquatica*	18.8	2	11	1	Cavity	5	95	100	13

Table 13. Parameters and summary of model describing characteristics of roosts (n = 15) used by female northern long-eared bats (*Myotis septentrionalis*) on the Coastal Plain of NC, 2019.

Variable	DF	Wald X^2	P > X^2
Height	1	5.59	0.07
DBH	1	0.05	0.66
Crown Class	2	5.45	0.24
Decay Stage	3	11.06	0.02
Model	Log-likelihood	P > X^2	AUC
Use ~ Height + DBH + Crown + Decay	-37.53	0.002	0.83

Table 14. Parameters and summary of model describing landscape characteristics of acoustic recorders sites (n = 10) with increased (i.e., recorder nights) probable Indiana bat (*Myotis sodalis*) presence on the Coastal Plain of NC, 2018–2019.

Variable	DF	Wald X^2	P > X^2
Deciduous	1	8.39	<0.01
Evergreen	1	34.54	<0.01
Mixed	1	83.63	<0.01
Woody Wetland	1	12.49	<0.01
Model	Log-likelihood	P > X^2	AUC
Nights ~ Deciduous + Evergreen + Mixed + Woody Wetland	-167.16	<0.001	0.89

Table 15. Parameters and summary of model describing landscape characteristics of acoustic recorders sites (n = 10) with increased (i.e., recorder nights) probable Indiana bat (*Myotis sodalis*) presence on the Coastal Plain of NC, 2018–2019.

Variable	DF	Wald X^2	P > X^2
Deciduous	1	0.01	0.93
Evergreen	1	8.65	<0.01
Mixed	1	3.29	0.07
Woody Wetland	1	19.83	<0.01
Model	Log-likelihood	P > X^2	AUC
Nights ~ Deciduous + Evergreen + Mixed + Woody Wetland	-109.88	<0.001	0.90

Table 16. Multiple analysis of variation (MANOVA) assessment of Euclidean distance between randomly generated points within the peripheral and core home ranges used by female northern long-eared bats (*Myotis septentrionalis*) to 14 land cover types on the Coastal Plain of NC, 2019.

Variable	DF	F-value	*P* > F
Patch	1	0.88	0.35
Edge	1	8.33	0.01*
Perforation	1	6.95	0.01*
Small Core	1	3.56	0.06
Medium Core	1	2.14	0.15
Large Core	1	NA	NA
Non-forest	1	8.21	0.01*
Woody Wetland	1	0.82	0.37
Upland Forest	1	0.66	0.42
Barren/Crop	1	5.44	0.02
Herbaceous/Crop	1	3.08	0.08
Developed/Road	1	7.34	0.01
Open Water	1	5.57	0.02
Canopy Break	1	1.13	0.29

*Included in quadratic discriminant function analysis.

Table 17. Multiple analysis of variation (MANOVA) assessment of Euclidean distance between randomly generated points within a 2.5 km buffer and peripheral home range of female northern long-eared bats (*Myotis septentrionalis*) to 14 land cover types on the Coastal Plain of NC, 2019.

Variable	DF	F-value	*P* > F
Patch	1	0.18	0.68
Edge	1	1.33	0.25
Perforation	1	27.97	<0.01*
Small Core	1	0.63	0.42
Medium Core	1	1.07	0.30
Large Core	1	26.37	<0.01*
Non-forest	1	5.23	0.02*
Woody Wetland	1	11.27	<0.01*
Upland Forest	1	11.80	<0.01*
Barren/Crop	1	0.45	0.50
Herbaceous/Crop	1	0.45	0.50
Developed/Road	1	0.86	0.35
Open Water	1	13.75	<0.01
Canopy Break	1	22.81	<0.01*

*Included in quadratic discriminant function analysis.

FIGURES

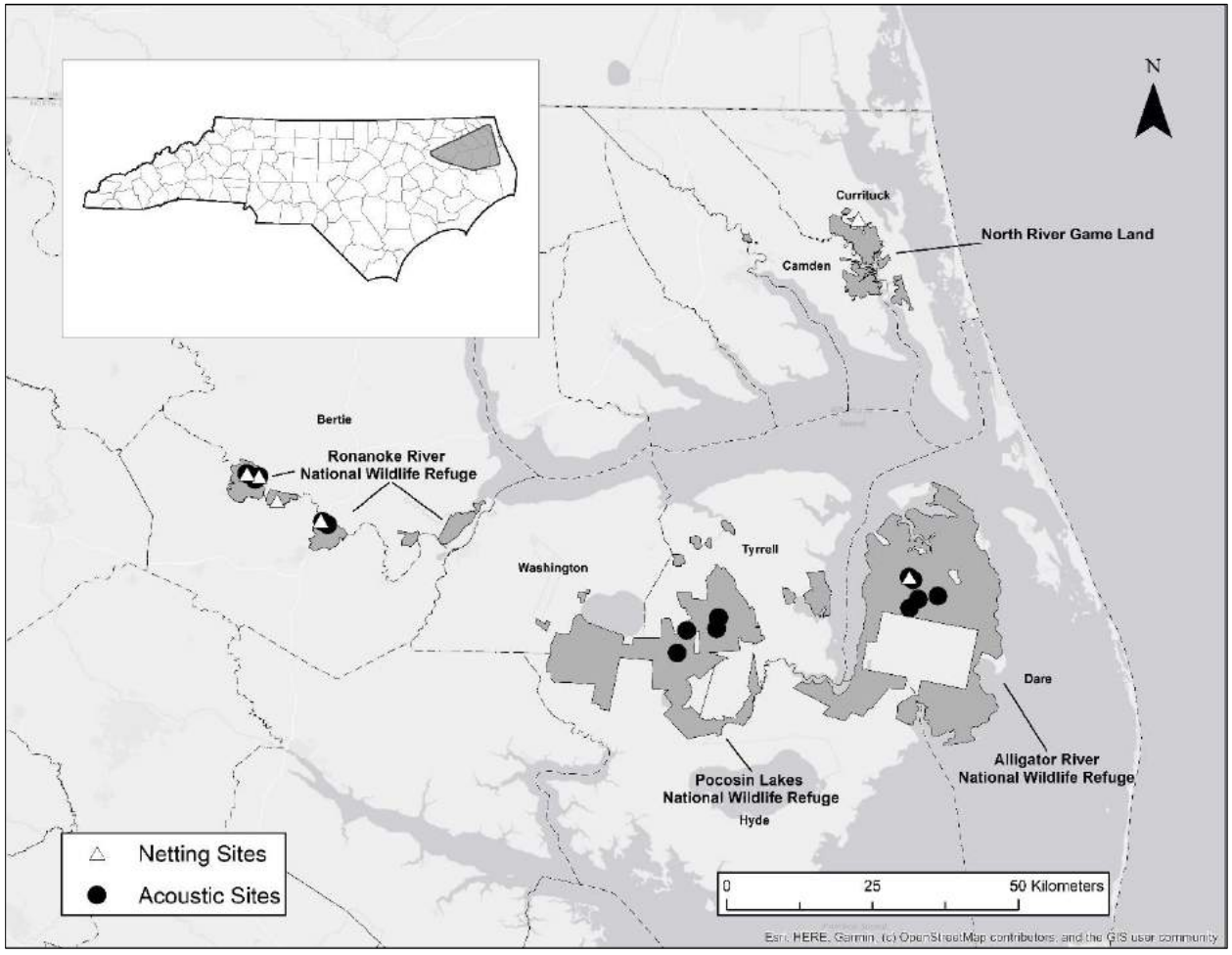

Figure 1. Approximate locations of acoustics and mist netting sampling sites in Bertie, Currituck, Dare, and Tyrell counties, NC, 2018–2019.

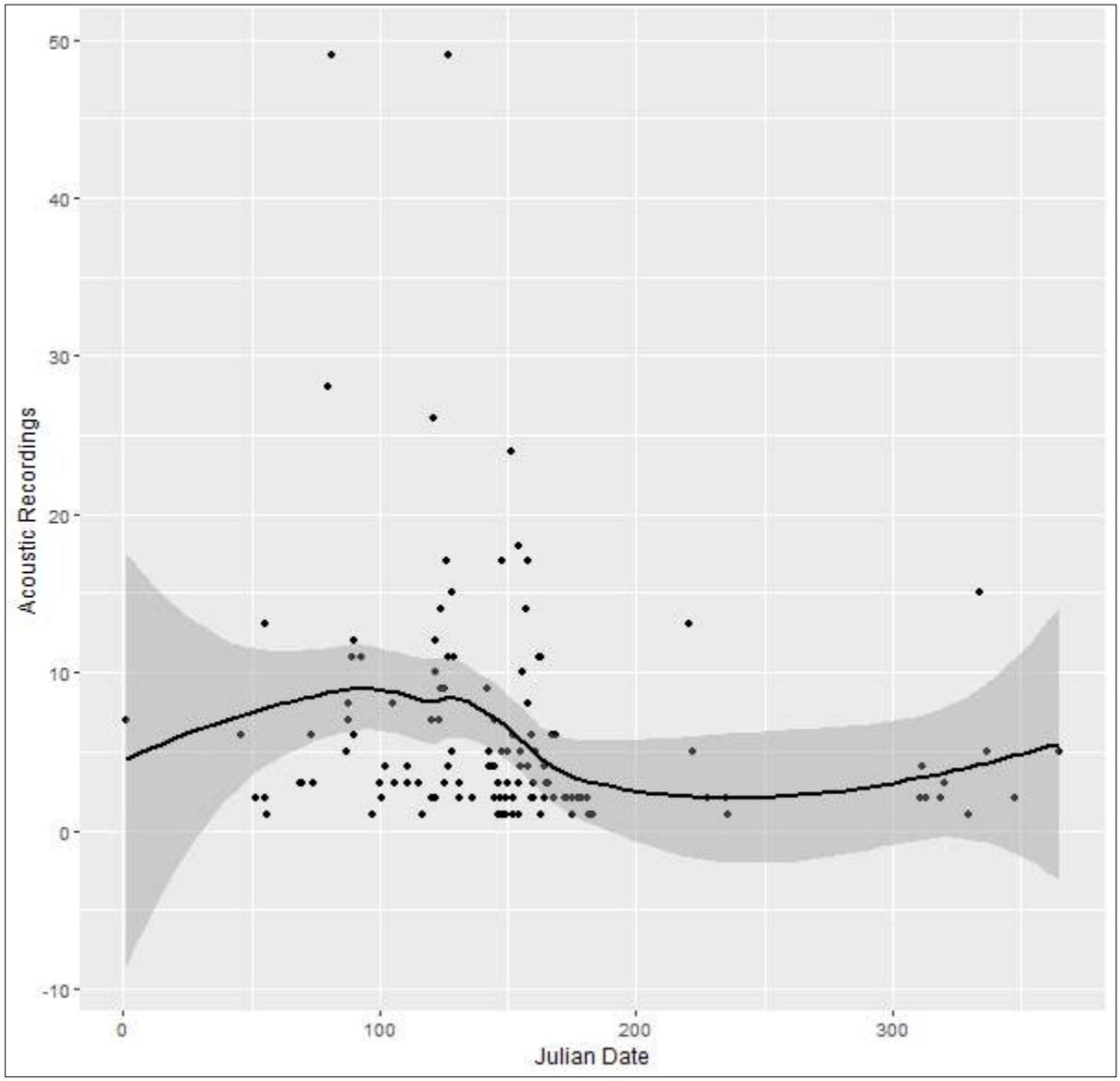

Figure 2. Activity of northern long-eared bats (*Myotis septentrionalis*) during nights of probably presence (MLE $P<0.05$) across the Coastal Plain of NC, 2018–2019.

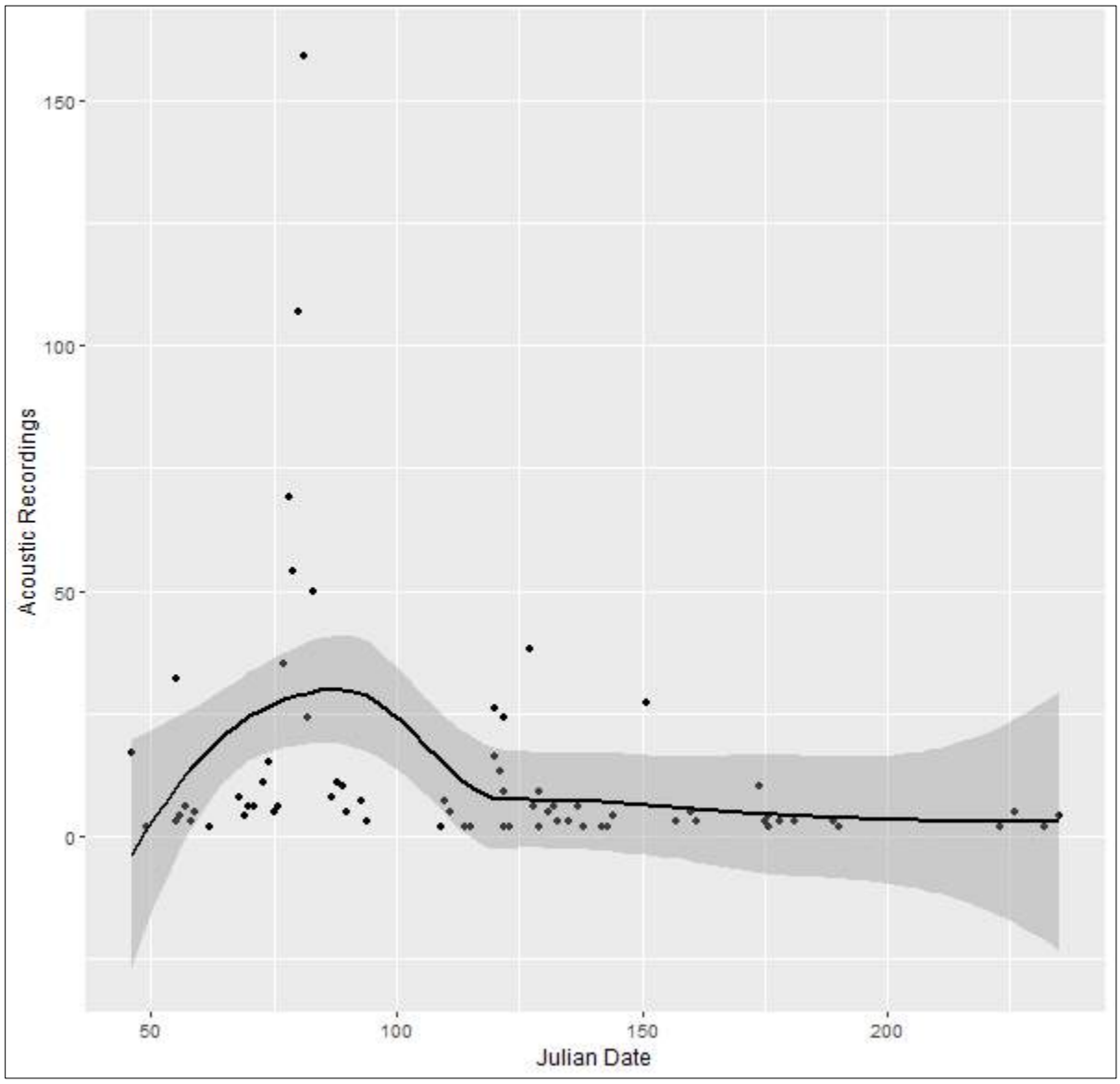

Figure 3. Activity of Indiana bats (*Myotis sodalis*) during nights of probably presence (MLE $P<0.05$) across the Coastal Plain of NC, 2018–2019.

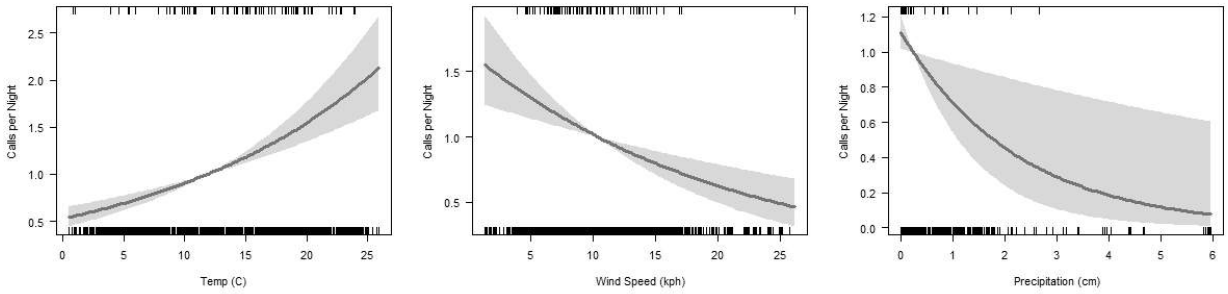

Figure 4. Predicted northern long-eared bat (*Myotis septentrionalis*) calls per night given temperature (C), wind speed (kph), and precipitation (cm) during spring on the Coastal Plain of NC and VA, 2017–2019.

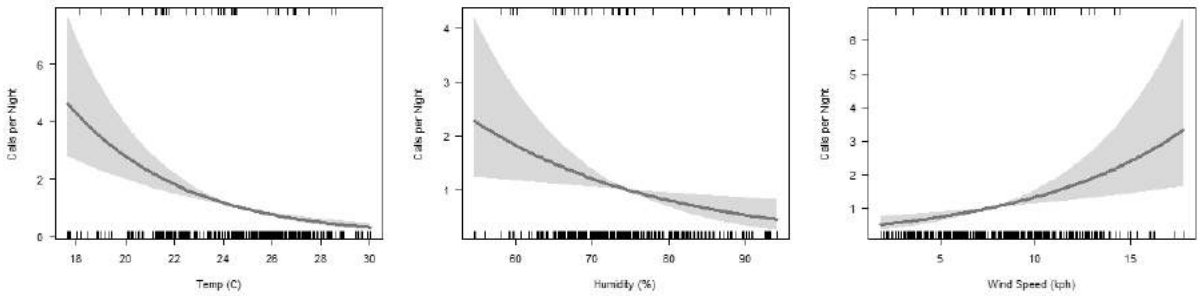

Figure 5. Predicted northern long-eared bat (*Myotis septentrionalis*) calls per night given temperature (C), humidity (%), and wind speed (kph) during summer on the Coastal Plain of NC and VA, 2017–2019.

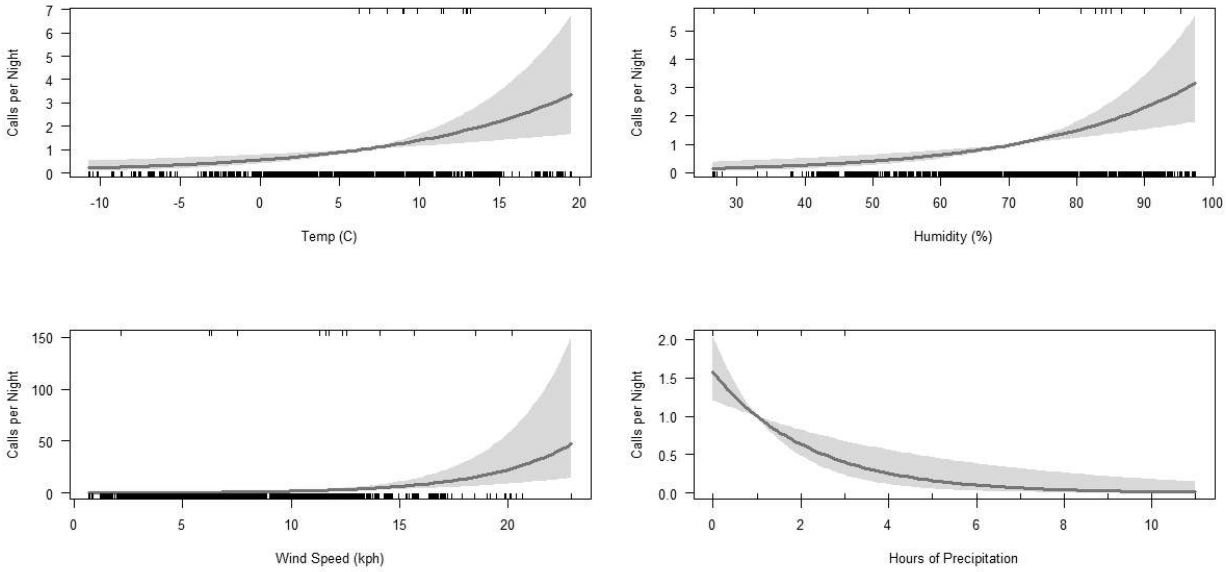

Figure 6. Predicted northern long-eared bat (*Myotis septentrionalis*) calls per night given temperature (C), humidity (%), wind speed (kph), and hours of precipitation during winter on the Coastal Plain of NC and VA, 2017–2019.

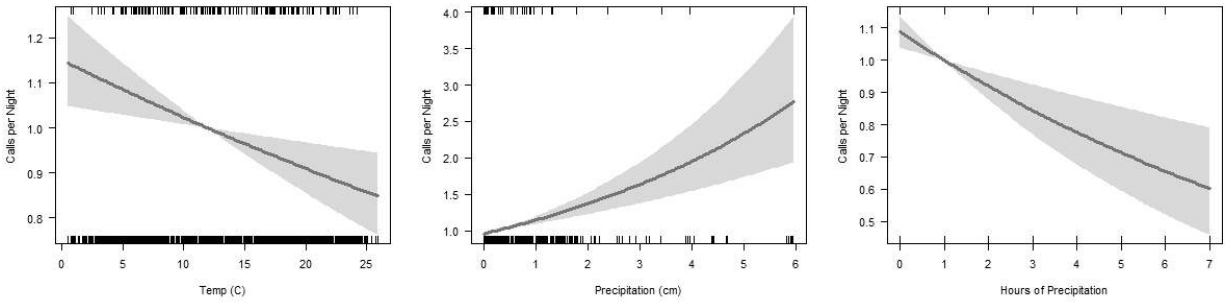

Figure 7. Predicted Indiana bat (*Myotis sodalis*) calls per night given temperature (C), precipitation (cm), and hours of precipitation during spring on the Coastal Plain of NC and VA, 2017–2019.

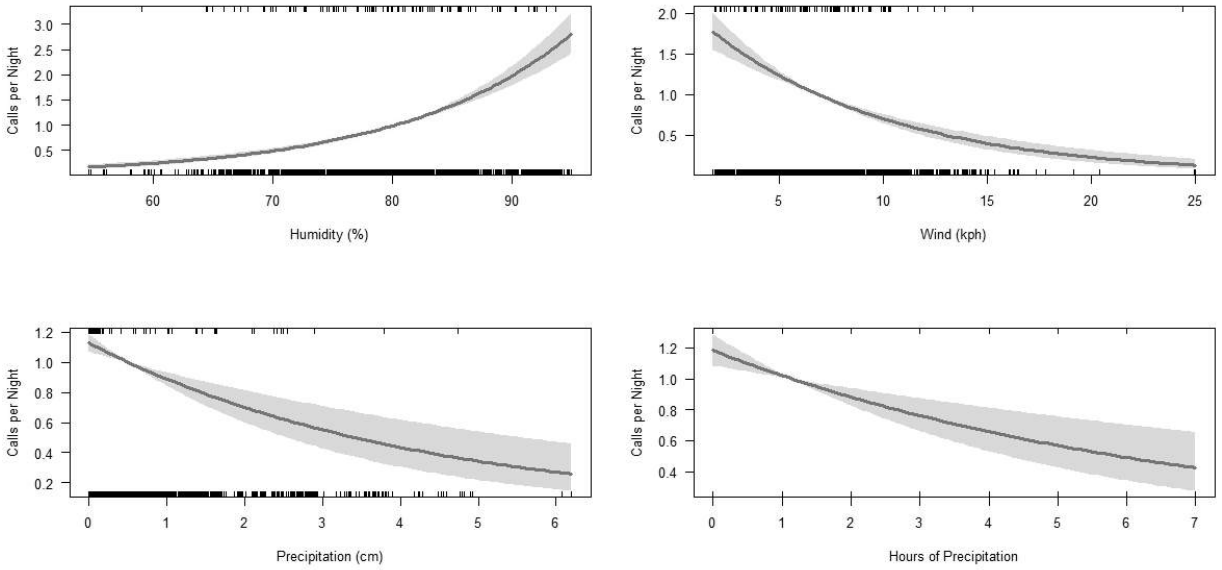

Figure 8. Predicted Indiana bat (*Myotis sodalis*) calls per night given humidity (%), wind (kph), precipitation (cm), and hours of precipitation during summer on the Coastal Plain of NC and VA, 2017–2019.

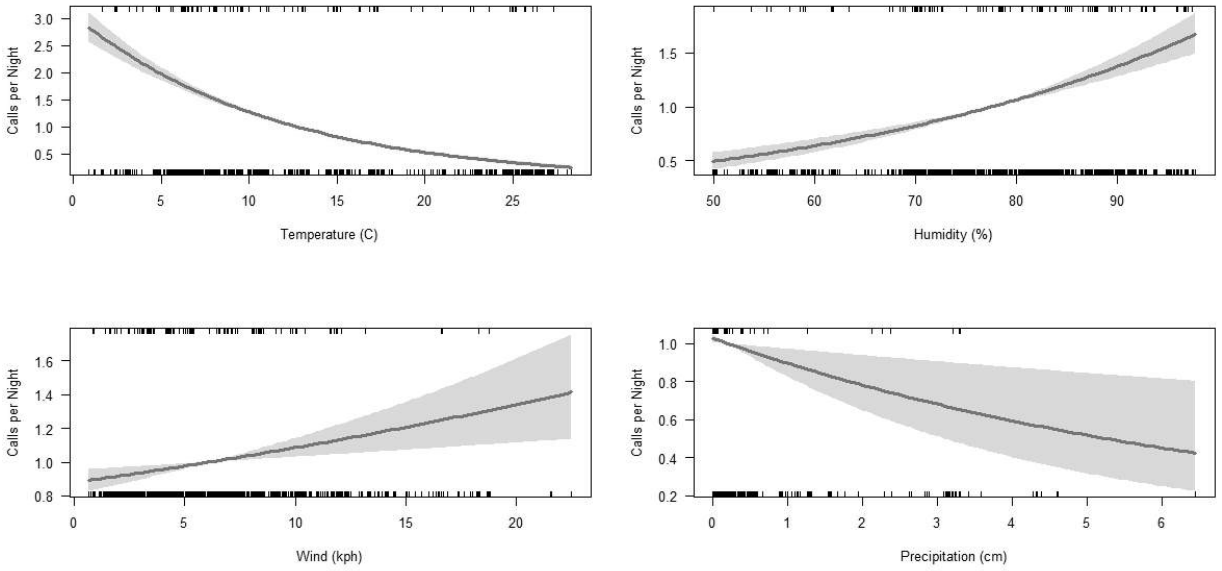

Figure 9. Predicted Indiana bat (*Myotis sodalis*) calls per night given temperature (C), humidity (%), wind (kph), and precipitation (cm) during fall on the Coastal Plain of NC and VA, 2017–2019.

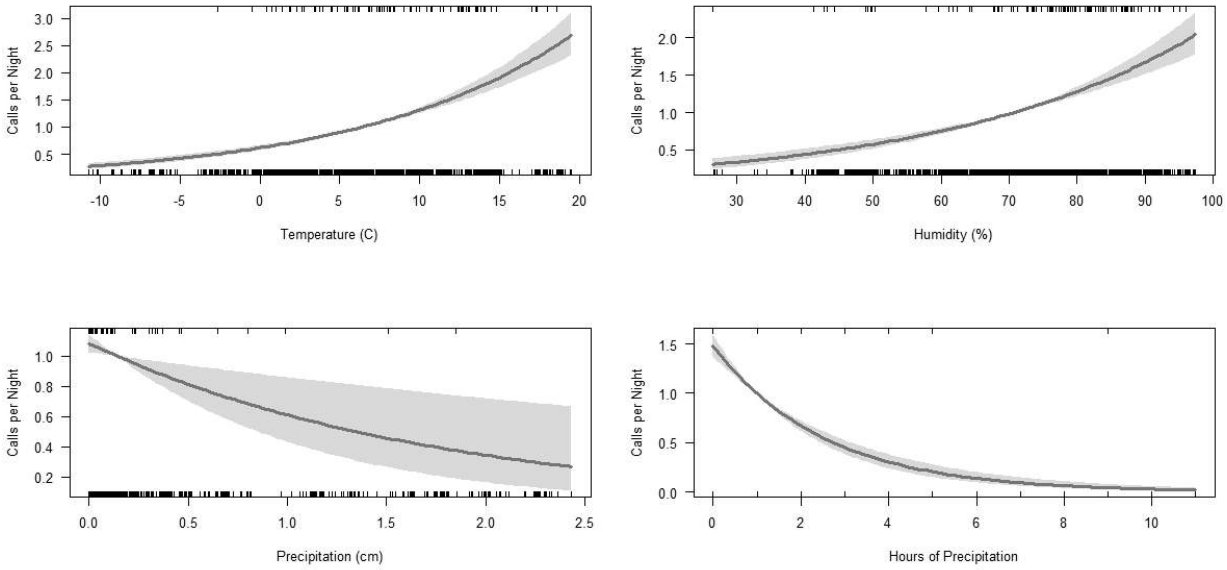

Figure 10. Predicted Indiana bat (*Myotis sodalis*) calls per night given temperature (C), humidity (%), precipitation (cm), and hours of precipitation during winter on the Coastal Plain of NC and VA, 2017–2019.

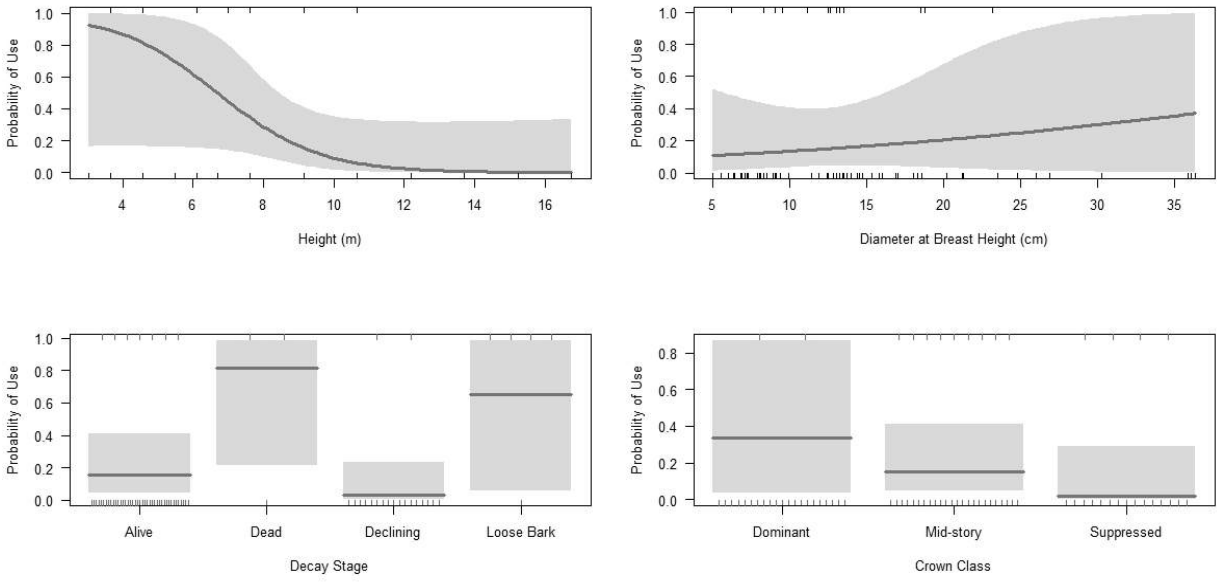

Figure 11. Probability of roost tree use by northern long-eared bats (*Myotis septentrionalis*) given height (m), diameter (cm), diameter at breast height (cm), decay stage, and crown class on the Coastal Plain of NC, 2019.

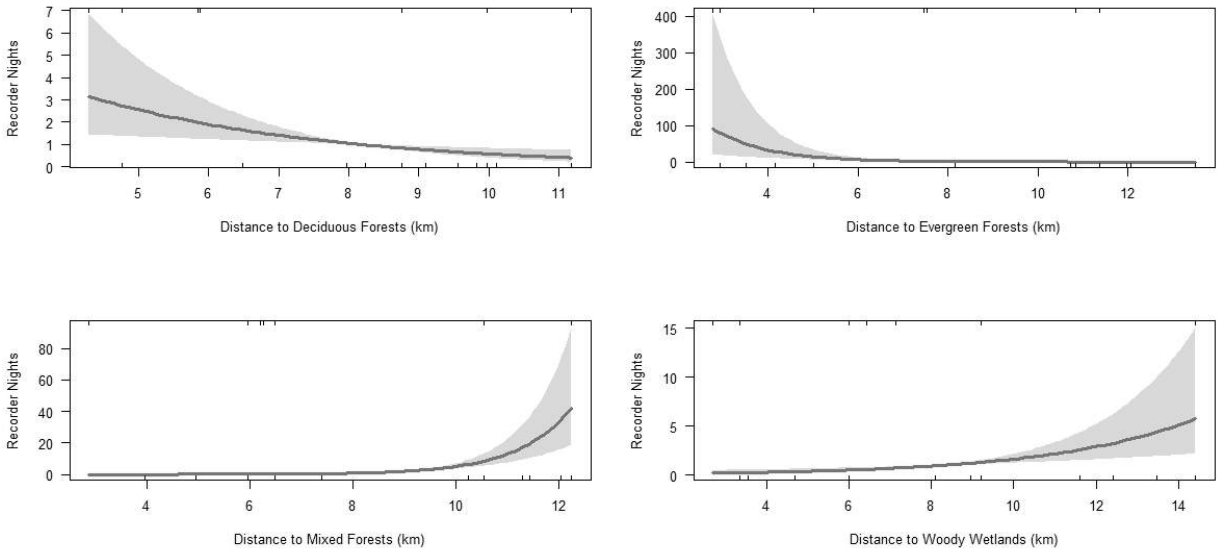

Figure 12. Predicted recorder nights of northern long-eared (*Myotis septentrionalis*) bat presence given distance (km) to deciduous forests, evergreen forests, mixed forests, and wood wetlands on the Coastal Plain of NC, 2017–2019.

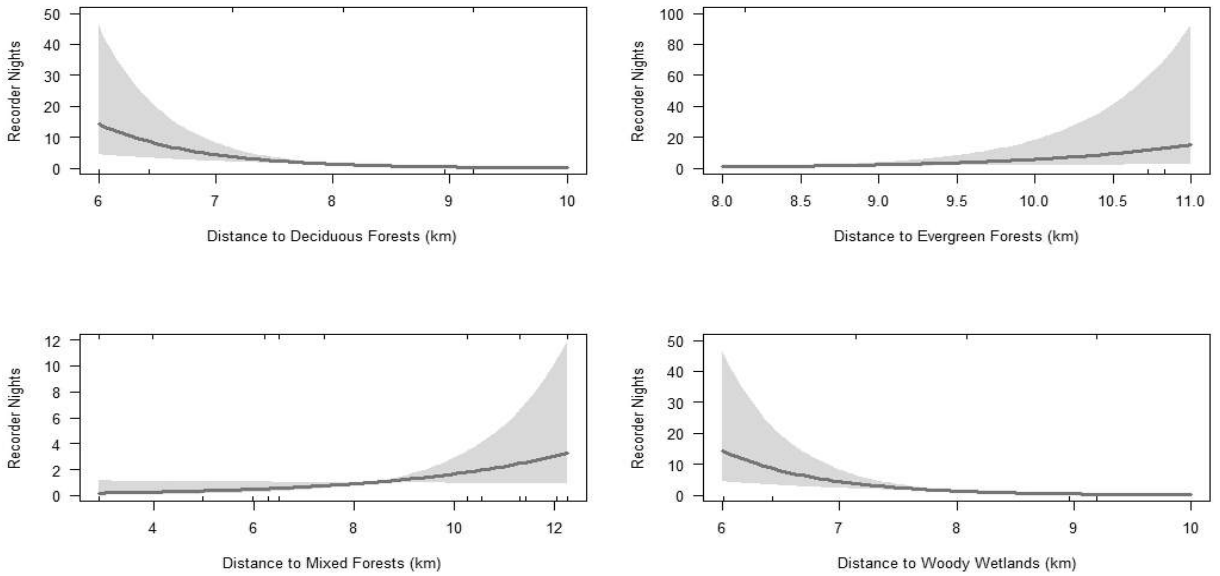

Figure 13. Predicted recorder nights of Indiana bat (*Myotis sodalis*) bat presence given distance (km) to deciduous forests, evergreen forests, mixed forests, and wood wetlands on the Coastal Plain of NC, 2017–2019.

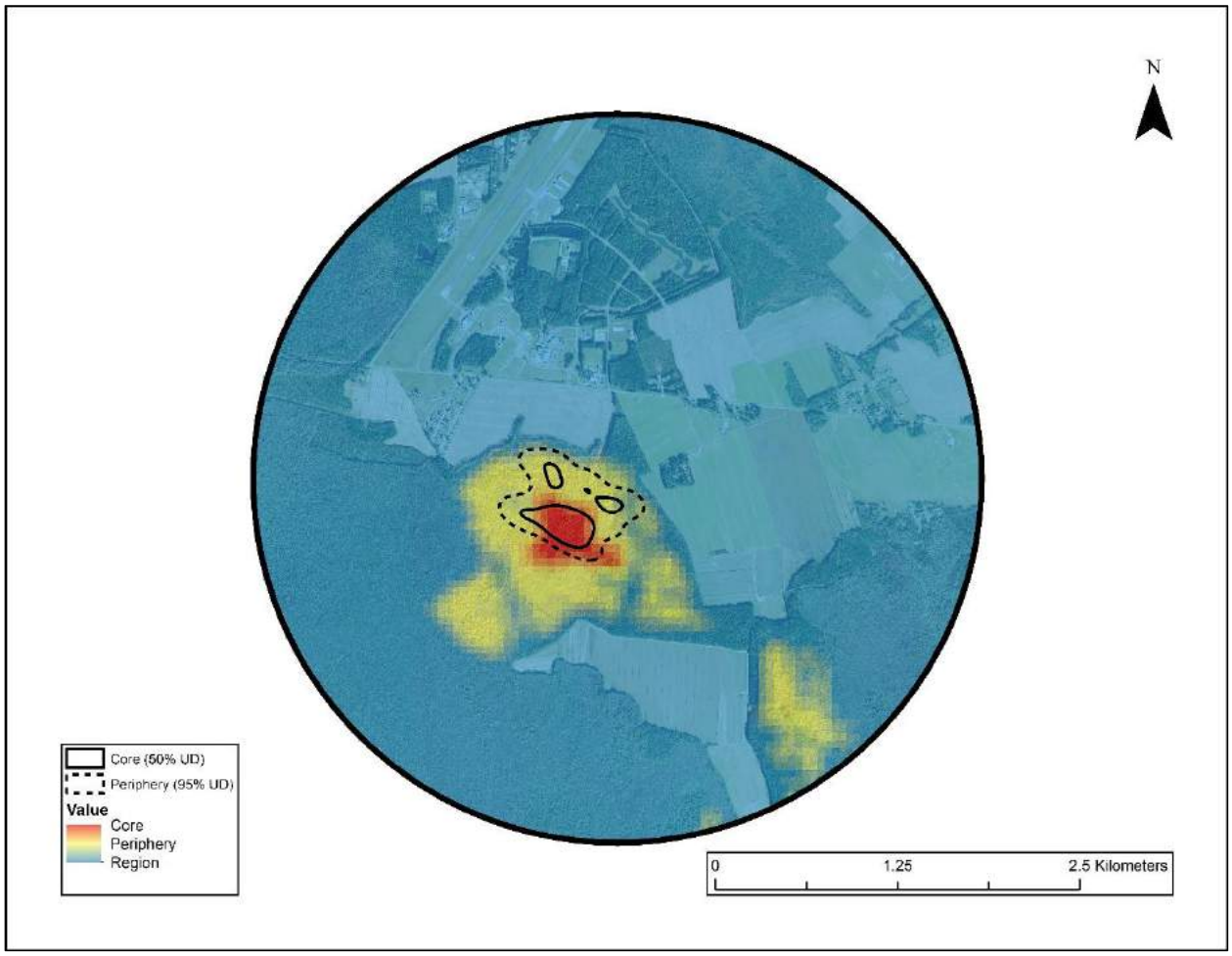

Figure 14. Northern long-eared bat (*Myotis septentrionalis*) second- and third-order habitat selection at NC Wildlife Resource Commission North River Game Land located in Camden and Currituck Counties, NC, 2019.

APPENDIX A: PHOTO GALLERY

Photo 01 – Alligator River – Acoustic Recording Station 01

Photo 02 – Alligator River – Acoustic Recording Station 02

Photo 03 – Alligator River – Acoustic Recording Station 03

Photo 04 – Alligator River – Acoustic Recording Station 04

Photo 05 – Alligator River – Acoustic Recording Station 05

Photo 06 – Pocosin Lakes – Acoustic Recording Station 01

Photo 07 – Pocosin Lakes – Acoustic Recording Station 02

Photo 08 – Pocosin Lakes – Acoustic Recording Station 03

Photo 09 – Pocosin Lakes – Acoustic Recording Station 04

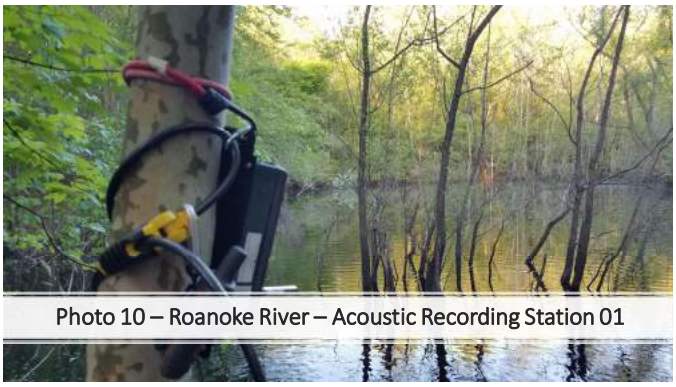

Photo 10 – Roanoke River – Acoustic Recording Station 01

Photo 11 – Roanoke River – Acoustic Recording Station 02

Photo 12 – Roanoke River – Acoustic Recording Station 03

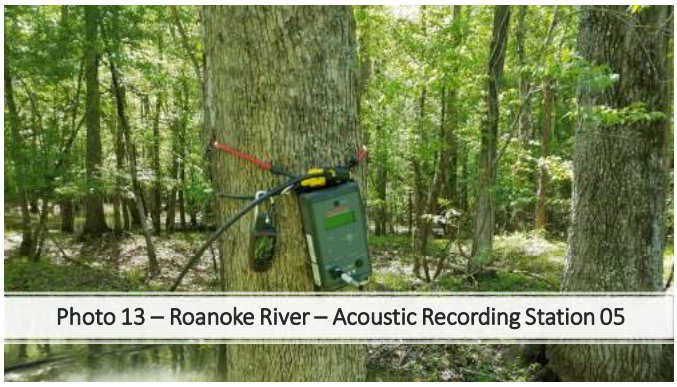

Photo 13 – Roanoke River – Acoustic Recording Station 05

Photo 14 – Roanoke River – Acoustic Recording Station 06

Photo 15 – Alligator River – Site 01 – Net A

Photo 16 – Alligator River – Site 01 – Net B

Photo 17 – Alligator River – Site 01 – Net C

Photo 18 – Alligator River – Site 01 – Net D

Photo 19 – Alligator River – Site 01 – Net E

Photo 20 – Roanoke River – Site 01 – Net A

Photo 21 – Roanoke River – Site 01 – Net AA

Photo 22 – Roanoke River – Site 01 – Net B

Photo 23 – Roanoke River – Site 01 – Net C

Photo 24 – Roanoke River – Site 01 – Net D

Photo 25 – Roanoke River – Site 01 – Net F

Photo 26 – Roanoke River – Site 02 – Net A

Photo 27 – Roanoke River – Site 02 – Net B

Photo 28 – Roanoke River – Site 02 – Net C

Photo 29 – Roanoke River – Site 03 – Net A

Photo 30 – Roanoke River – Site 03 – Net B

Photo 31 – Roanoke River – Site 03 – Net C

Photo 32 – Roanoke River – Site 03 – Net D

Photo 33 – Roanoke River – Site 04 – Net A

Photo 34 – Roanoke River – Site 04 – Net B

Photo 35 – Roanoke River – Site 05 – Net A

Photo 36 – Roanoke River – Site 05 – Net B

Photo 37 – North River – Site 01 – Net A

Photo 38 – North River – Site 01 – Net B

Photo 39 – North River – Site 01 – Net C

Photo 40 – North River – Site 01 – Net D

Photo 41 – North River – Site 01 – Net DD

Photo 42 – North River – Site 01 – Net E

Photo 43 – North River – Site 01 – Net F

Photo 44 – North River – Site 01 – Net G

Photo 45 – North River – Roost 140.01

Photo 46 – North River – Roost 549.01

Photo 47 – North River – Roost 549.02

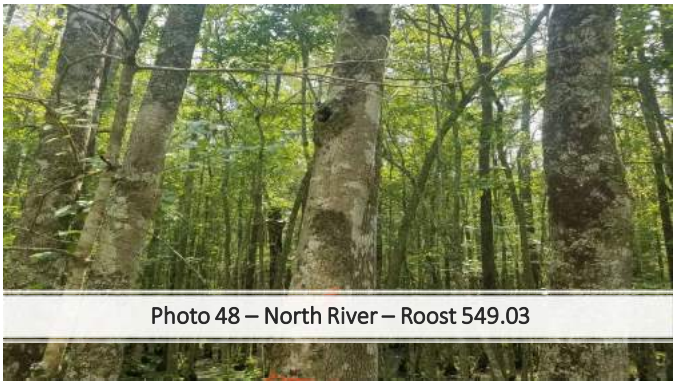

Photo 48 – North River – Roost 549.03

Photo 49 – North River – Roost 590.01

Photo 50 – North River – Roost 590.02

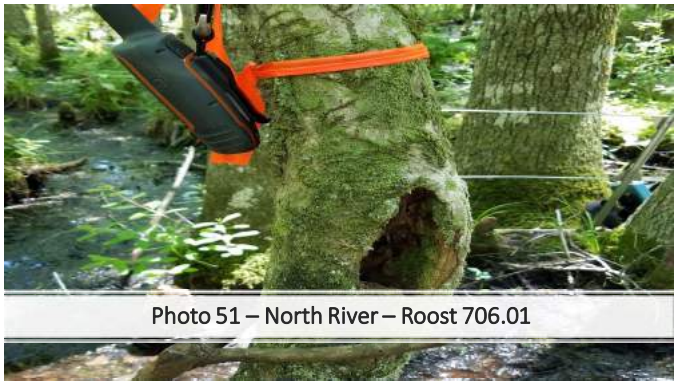

Photo 51 – North River – Roost 706.01

Photo 52 – North River – Roost 706.02

Photo 53 – North River – Roost 706.03

Photo 54 – North River – Roost 745.01

Photo 55 – North River – Roost 745.02

Photo 56 – North River – Roost 786.01

Photo 57 – North River – Roost 909.01

Photo 58 – North River – Roost 909.02

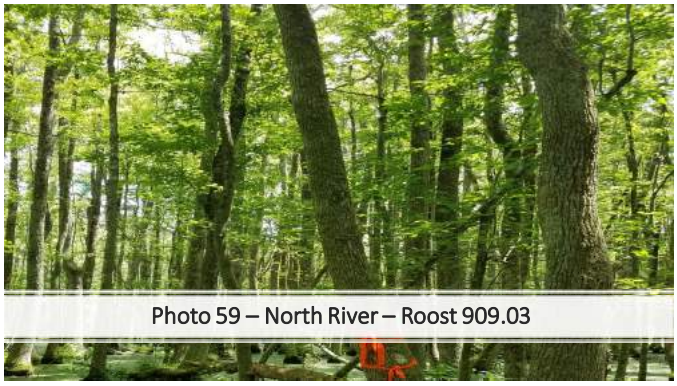

Photo 59 – North River – Roost 909.03

Photo 60 – Bat VDGIF A50724

Photo 60 – Bat VDGIF A50750

Photo 60 – Bat VDGIF A50725

Photo 60 – Bat VDGIF A50726

Photo 60 – Bat VDGIF A50727

Photo 60 – Bat VDGIF A50728

*Not all captured bats were photographed and photos provided confirm proper northern long-eared bat identification.

APPENDIX B: DATA SHEETS

Acoustic Deployment Sheet

State: NC Location: Roanoke River

Site Name (GPS ID): RR-01 Hub Coordinates: GPS #: 9

Dates: to 8/14/19 (Data)

Basal Area (& factor): 8 (20)

Deployment

Style: Tree Personnel: JLD

Detector: Flashcard: Mic:

	N	E	S	W
Densiometer	100	50	87	100
Distance (m)	0.95	0.1	0.8	1.2
Canopy Cover	5	5	5	5

Site Description: Young forest near pond

Comments:

Site Name (GPS ID): RR-02 Coordinates: GPS #: 9

Dates: to 8/14/19

Basal Area (& factor): 22 (20)

Deployment

Style: Tree Personnel: JLD

Detector: Flashcard: Mic:

	N	E	S	W
Densiometer	-9	100	-2	-3
Distance (m)	2.1	4.0	4.4	9.1
Canopy Cover	CD	I	5	CD

Site Description: Mature swamp road crossing

Comments:

Site Name (GPS ID): RR.03 Coordinates: GPS #: 7

Dates: to 8/14/19

Basal Area (& factor): 10 (20)

Deployment

Style: Tree Personnel: JLD

Detector: Flashcard: Mic: U1

	N	E	S	W
Densiometer	-8	-4	-11	-12
Distance (m)	1.1	2.1	4.1	3.8
Canopy Cover	CD	5	CD	5

Site Description: Mature swamp crossing

Comments:

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Acoustic Deployment Sheet

State: NC Location: Roanoke River

Site Name (GPS ID): RR-7 Coordinates: GPS #: 9

Dates: to 8/14/19* Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 1 (20) Detector: 4-112 Flashcard: 8g.g Mic: CU

	N	E	S	W
Densiometer	-84	-88	-88	-72
Distance (m)	6.5	5.5	7.0	6.8
Canopy Cover	5	5	5	5

Site Description: At bridge mouth of stream & Roanoke River

Comments:

Site Name (GPS ID): RR-05 Coordinates: GPS #: 9

Dates: to 8/14/19 Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 3 (20) Detector: 4-51 Flashcard: 8g.g Mic: CU

	N	E	S	W
Densiometer	-12	-4	-15	-11
Distance (m)	9.5	4.0	3.2	10.5
Canopy Cover	I	D	CD	I

Site Description: Along corridor & ditch

Comments:

Site Name (GPS ID): RR-04 Coordinates: GPS #: 9

Dates: to 8/14/19 Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 5 (20) Detector: 4-141 Flashcard: 8g.g Mic: CU

	N	E	S	W
Densiometer	-13	-7	-5	-12
Distance (m)	7.1	10.3	7.3	6.8
Canopy Cover	S	CD	CD	I

Site Description: Same as 05

Comments:

Retr & Removal

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Acoustic Deployment Sheet

State: NC Location: Pocosin Lakes

Site Name (GPS ID): PL-04 Coordinates: GPS #: 9

Dates: to 8/14/19

Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 2 (20)

Detector: EC-30 Flashcard: 32gig Mic: U1

	N	E	S	W
Densiometer	-2Y	100	-5Y	-5
Distance (m)	0.7	35	11.0	1.5
Canopy Cover	5	5	CD	5

Site Description: Road Intersection w/ large ditch

Comments:

Site Name (GPS ID): PL-03 Coordinates: GPS #: 9

Dates: to 8/14/19

Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 10 (20)

Detector: 4-41 Flashcard: 32g Mic: U1

	N	E	S	W
Densiometer	-2	3	-1	-5
Distance (m)	4.7	3.2	1.1	9
Canopy Cover	CD	5	5	I

Site Description: cluttered forest + ditch

Comments:

Site Name (GPS ID): PL-02 Coordinates: GPS #: 9

Dates: to 8/14/19

Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 6 (20)

Detector: 4-84 Flashcard: 8g Mic: U1

	N	E	S	W
Densiometer	-44	-6	-1	34
Distance (m)	0.4	1.8	1.2	1.6
Canopy Cover	5	I	5	5

Site Description: Corner of road along Clearcut

Comments:

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Acoustic Deployment Sheet

State: NC Location: Pocosin Lakes

Site Name (GPS ID): PL-01 Coordinates: GPS #: 9

Dates: to 8/14/19

Deployment

Style: Tree Personnel: JLD

Basal Area (& factor): 6 (20)

Detector: 4-77 Flashcard: 8g Mic: U1

	N	E	S	W
Densiometer	-2	-4	-14	-4
Distance (m)	0.7	2.4	0.3	1.3
Canopy Cover	I	S	I	S

Site Description: Oaked + grassy road near channel

Comments:

Alligator River

Site Name (GPS ID): AR-02 Coordinates: GPS #: 9

Dates: to 8/15/19

Deployment

Style: Tree Personnel: JLD

Basal Area (& factor): 6 (20)

Detector: 4-104 Flashcard: 8g Mic: U1

	N	E	S	W
Densiometer	-4	-24	-8	-7
Distance (m)	1.0	1.1	0.2	0.3
Canopy Cover	S	S	S	S

Site Description: Along Road

Comments: Mic destroyed by bear, batteries exposed, SD out

Site Name (GPS ID): AR-01 Coordinates: GPS #:

Dates: to 8/15/19

Deployment

Style: Tree Personnel: JLD

Basal Area (& factor): 8 (20)

Detector: 4-120 Flashcard: 8g Mic: U1

	N	E	S	W
Densiometer	-4	-5	-14	-24
Distance (m)	0.7	1.7	1.6	8.0
Canopy Cover	S	S	S	S

Site Description: Road intersection w/ ditch

Comments:

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Acoustic Deployment Sheet

State: NC Location: Alligator

Site Name (GPS ID): AR-05 Coordinates: GPS #: 9

Dates: to 8/15/19 Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 7 (20) Detector: 4-124 Flashcard: 8g Mic: 41

	N	E	S	W
Densiometer	-16	-2	-19	-6
Distance (m)	0.8	1.4	2.8	1.6
Canopy Cover	CD	D	I	S

Site Description: over pond

Comments:

Site Name (GPS ID): RR-04 Coordinates: GPS #: 9

Dates: to 8/15/19 Deployment Style: Tree Personnel: JLD

Basal Area (& factor): 5 (20) Detector: 4-144 Flashcard: 8g Mic: 41

	N	E	S	W
Densiometer	-24	-6	-18	-64
Distance (m)	12.6	2.5	7.5	1.6
Canopy Cover	D	I	I	S

Site Description: 4-way Int & channel

Comments:

Site Name (GPS ID): Coordinates: GPS #:

Dates: to Deployment Style: Personnel:

Basal Area (& factor): Detector: Flashcard: Mic:

	N	E	S	W
Densiometer				
Distance (m)				
Canopy Cover				

Site Description:

Comments:

If this sheet is found please contact Mark Ford: (540) 231 - 5927 wmford@exchange.vt.edu

Bat capture data

Page #:

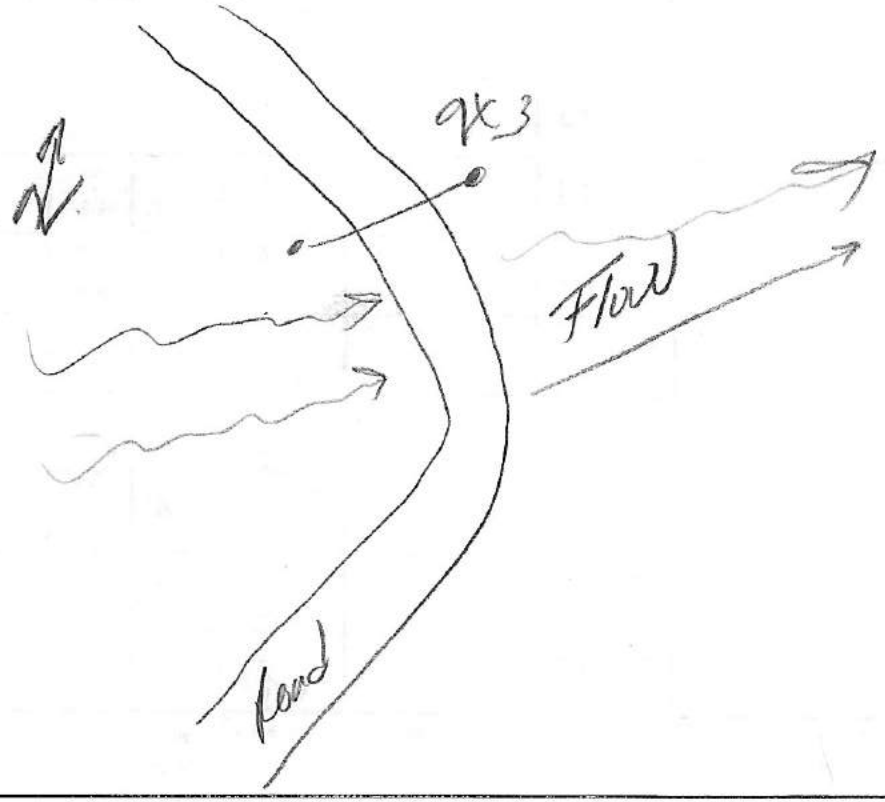
Area: Roanoke River	Site: Site 1	GPS unit: #9	GPS id:
Date: 4/30/18	Team leader: Josh DeLaCruz	Other personnel: ———	
Cloud cover %: 0	Precipitation: None	General habitat: Typelo	
Start temp. (°C) 18.9	End temp. (°C) 16.1	Other comments: Near Known roost	
Start wind (Beaufort) 0	End wind (Beaufort) 2		
Start humidity: 32	End humidity: 54%		
Start time: 20:00	End time: 22:00		
Number of net sets: 1			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Area is stream crossing along tupelo/Cypress stream/swamp. Tree cover high, Creek high but slow flow.

Tent Caterpillar hatch

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2015	A	LABO	♀ ♂	9.5	43	Adult Juv.	NR	0 1 2 3	—	☐ ☐	
2	2030	A	LABO	♀ ♂	7.8	39	Adult Juv.	NR	0 1 2 3	—	☐ ☐	
3	2040	A	LABO	♀ ♂	11.6	40	Adult Juv.	NR	0 1 2 3	—	☐ ☐	
4	2126	A	NYHU	♀ ♂	10.1	35	Adult Juv.	P	0 1 2 3	—	☐ ☐	
5	2148	A	LABO	♀ ♂	11.4	42	Adult Juv.	NR	0 1 2 3	—	☐ ☐	Hole left wing
6				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

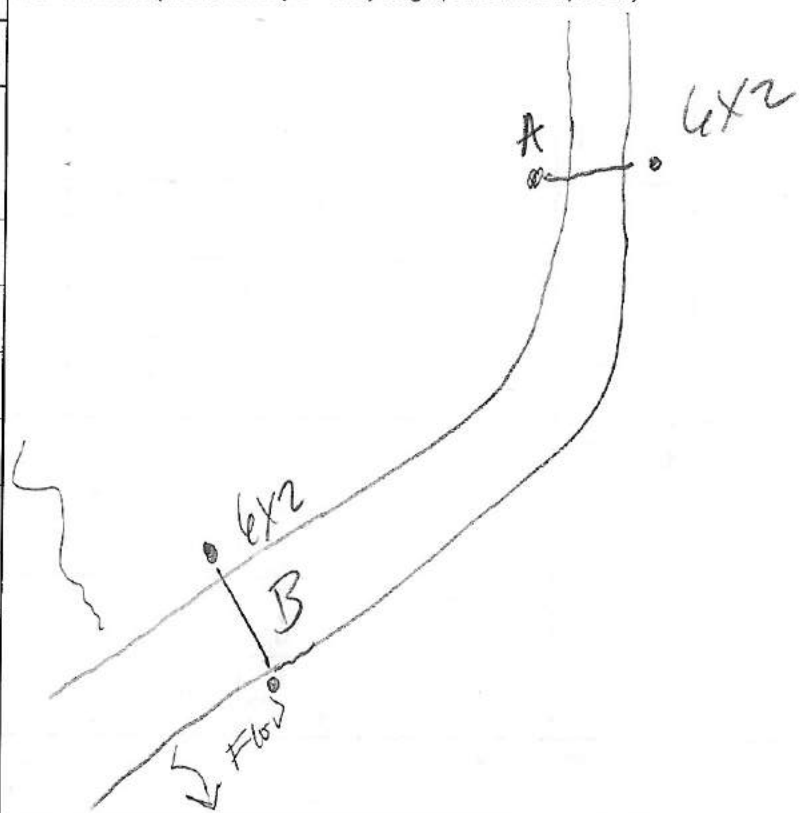
Bat capture data

Page #:

Area: Roanoke River	Site: 2	GPS unit: 9	GPS id:
Date: 5/1/18	Team leader: Jesse DeLaCruz	Other personnel: ———	
Cloud cover %: 0	Precipitation: None	General habitat: Hard Woods / Cypress Swamp	
Start temp. (°C) 19.8	End temp. (°C) 18.5	Other comments:	
Start wind (Beaufort) 0	End wind (Beaufort) 3		
Start humidity: 52%	End humidity: 69%		
Start time: 2000	End time: 0500	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 2			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Area is road through hardwood through riverine cypress swamp. Nets are located in narrow high canopy-cover corridors



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2210	A	MYAU	♀ ♂	8.6	37	Adult Juv.	P	0 1 2 3	—	☐	☐	
2	2210	A	CORA	♀ ♂	11.0	42	Adult Juv.	P	0 1 2 3	—	☐	☐	
3	2231	A	CORA	♀ ♂	10.75	41	Adult Juv.	P	0 1 2 3	—	☐	☐	
4	2236	B	MYAU	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	ESCAPE NET
5	2251	A	MYAU	♀ ♂	6.5	37	Adult Juv.	P	0 1 2 3	—	☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

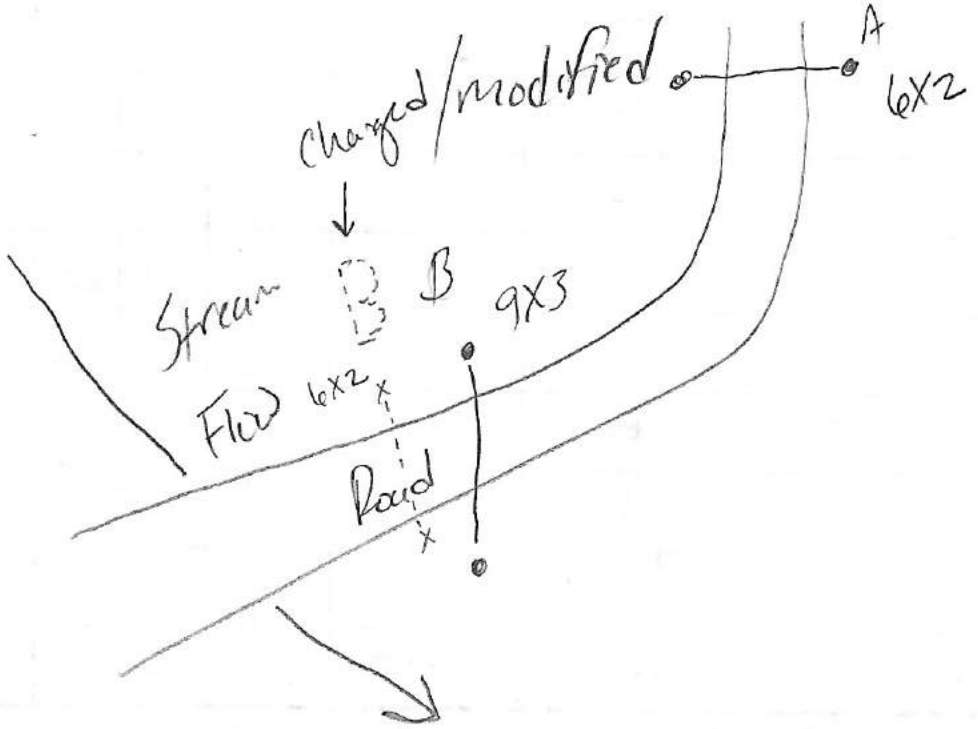
Bat capture data

Page #:

Area: Roanoke River	Site: Site 2	GPS unit: 9	GPS id:
Date: 5/8/18	Team leader: Jesse DeLa Cruz	Other personnel: ——	
Cloud cover %: 100	Precipitation: None	General habitat: See previous	
Start temp. (°C) 16.8	End temp. (°C) 16	Other comments: Water up but water marks suggest it is currently dropping.	
Start wind (Beaufort) 3	End wind (Beaufort) 2		
Start humidity: 82%	End humidity: 82%		
Start time: 2000	End time: 2300	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 2			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See previous



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2040	A	LABO	♀ ♂	11.5	41	Adult Juv.	NR	0 1 2 3		☐ ☐	
2	2055	B	CORA	♀ ♂	10.0	43	Adult Juv.	NR	0 1 2 3		☐ ☐	
3	2105	B	LABO	♀ ♂	9.5	39	Adult Juv.	NR	0 1 2 3		☐ ☐	
4	2200	A	CORA	♀ ♂	8.5	42	Adult Juv.	NR	0 1 2 3		☐ ☐	
5	2210	B	CORA	♀ ♂	10.0	44	Adult Juv.	NR	0 1 2 3		☐ ☐	
6	2210	B	MYAU	♀ ♂	8.5	38	Adult Juv.	P	0 1 2 3		☐ ☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

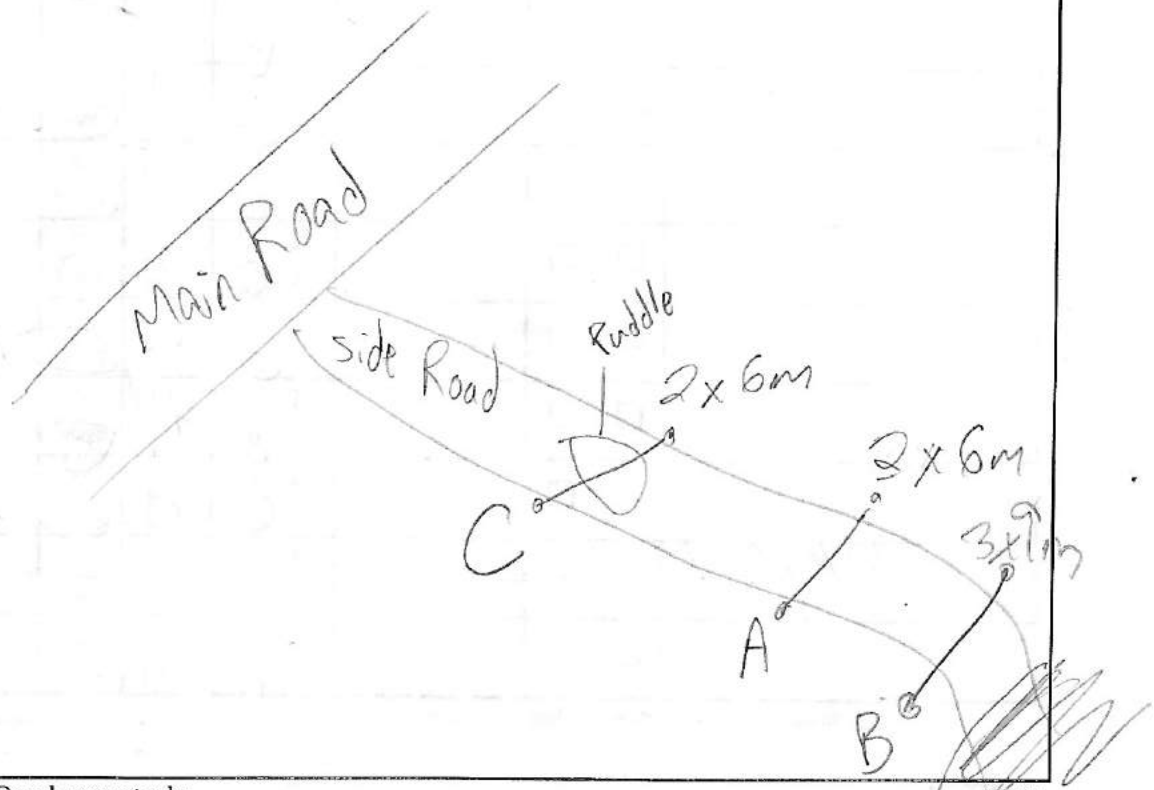
Bat capture data

Page #: 1

Area: Roanoke River NWR	Site: Site 2	GPS unit: 9	GPS id: Site 2
Date: 5-9-18	Team leader: Jesse D.	Other personnel: M Muthers	
Cloud cover %: 0	Precipitation: —	General habitat: Mesic hardwood swamp	
Start temp. (°C) 20.1	End temp. (°C) 13.0	Other comments:	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 78 %	End humidity: 100 %		
Start time: 20:10	End time: ~~2200~~	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 3			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous



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rev. 1.6.17

Swamp

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	21:00	B	LABO	♀ ♂	11.6	43	Adult Juv.	NR	0 1 2 3		☐	☐	
2	21:02	A	LABO	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	ESCAPE
3	21:25	B	MYAU	♀ ♂	11.6	35	Adult Juv.	P	0 1 2 3		☐	☐	
4	21:25	B	EPFU	♀ ♂	13.9	43	Adult Juv.	NR	0 1 2 3		☐	☐	
5	21:46	B	PESU	♀ ♂	5.5	34	Adult Juv.	NR	0 1 2 3		☐	☐	
6	2207	B	LABO	♀ ♂	14.0	40	Adult Juv.	P	0 1 2 3		☐	☐	
7	2209	B	LABO	♀ ♂	15.7	42	Adult Juv.	P	0 1 2 3		☐	☐	
8	22:30	A	MYAU	♀ ♂	8.0	37	Adult Juv.	P	0 1 2 3		☐	☐	
9	22:45	C	CORA	♀ ♂	10.7	43	Adult Juv.	P	0 1 2 3		☐	☐	
10	22:45	A	MYAU	♀ ♂	9.75	37	Adult Juv.	P	0 1 2 3		☐	☐	
11	2310	A	MYAU	♀ ♂	6.1	38	Adult Juv.	NR	0 1 2 3		☐	☐	
12	2320	A	CORA	♀ ♂	10.0	43	Adult Juv.	NR	0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

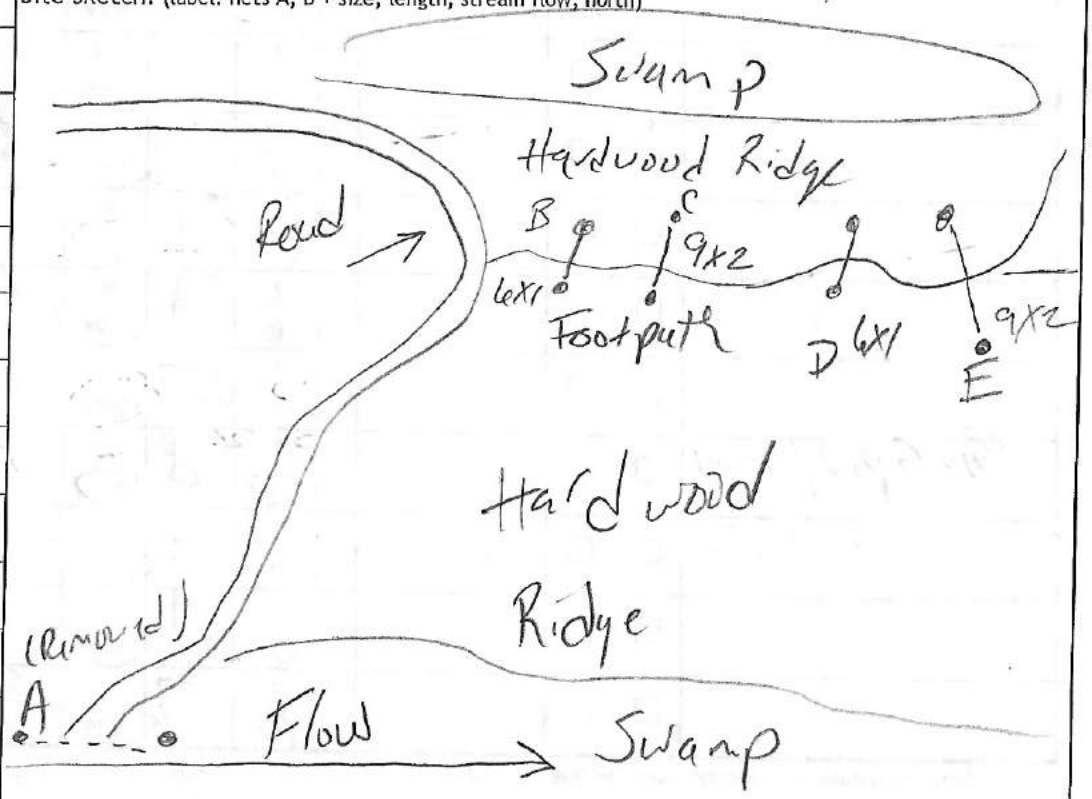
Page #:

Area: Roanoke River	Site: Site 1	GPS unit: 9	GPS id:
Date: 5-21-18	Team leader: Jesse DeLeCruz	Other personnel: Mike Mutherbaugh	
Cloud cover %: 0 %	Precipitation: None	General habitat: See previous	
Start temp. (°C) 21.0	End temp. (°C) 21.0	Other comments: Rain system moved through earlier in day, little rain present at site	
Start wind (Beaufort) 1	End wind (Beaufort) 0		
Start humidity: 100 %	End humidity: 100		
Start time: 2010	End time: 0000		
Number of net sets: 4			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	20:12	E	LABO	♀ ♂	13.0	43	Adult Juv.	L	0 1 2 3		☐	☐	
2	20:50	C	CORA	♀ ♂	10.5	41	Adult Juv.	P	0 1 2 3		☐	☐	
3	20:55	E	MYAU	♀ ♂	—	—	Adult Juv.	P	0 1 2 3	—	☐	☐	Escapee
4	21:25	E	MYAU	♀ ♂	9.4	37	Adult Juv.	P	0 1 2 3		☐	☐	mite / old scars
5	21:50	E	MYAU	♀ ♂	9.0	38	Adult Juv.	L/P	0 1 2 3		☐	☐	
6	21:50	E	MYAU	♀ ♂	9.3	37	Adult Juv.	P/L	0 1 2 3		☐	☐	
7	22:50	E	MYAU	♀ ♂	9.7	39	Adult Juv.	P/L	0 1 2 3		☐	☐	
8	22:50	E	MYAU	♀ ♂	10.6	38	Adult Juv.	P/L	0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

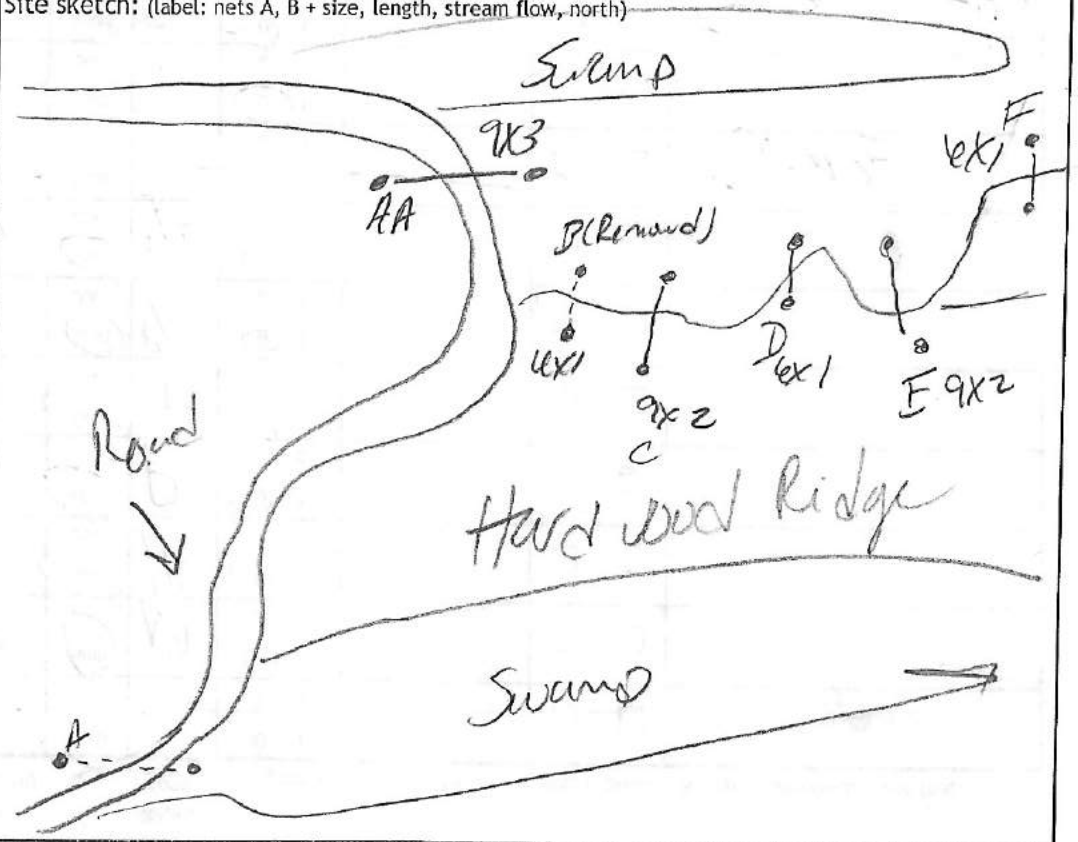
Area: Roanoke River NWR	Site: Site 1	GPS unit: 9	GPS id:
Date: 5/22/18	Team leader: Jesse DeLeCruz	Other personnel: Mike Muthersbaugh	
Cloud cover %: 0%	Precipitation: None	General habitat: See previous	
Start temp. (°C) 25	End temp. (°C) 23	Other comments: Less intense precipitation in region today, little cloud cover and	
Start wind (Beaufort) 2	End wind (Beaufort) 2		
Start humidity: 83%	End humidity: 88%	wind.	
Start time: 20:10	End time: 00:15		

Number of net sets: 5

Site description: (habitat, tree cover around nets, creek condition, etc.)

See previous

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	20:55	E	CORA	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	Escapee
2	2150	E	CORA	♀ ♂	7.1	41	Adult Juv.	NR	0 1 2 3		☐	☐	
3	2150	E	CORA	♀ ♂	8.3	39	Adult Juv.	NR	0 1 2 3		☐	☐	
4	2150	F	CORA	♀ ♂	10.3	42	Adult Juv.	P	0 1 2 3		☐	☐	
5	2150	F	CORA	♀ ♂	10.2	42	Adult Juv.	P	0 1 2 3		☐	☐	
6	2246	C	MYAU	♀ ♂	10.0	38	Adult Juv.	P/L	0 1 2 3		☐	☐	
7	2247	D	MYAU	♀ ♂	9.4	39	Adult Juv.	P/L	0 1 2 3		☐	☐	
8	2247	D	MYAU	♀ ♂	—		Adult Juv.		0 1 2 3	—	☐	☐	ESCAPE
9	23:24	AA	CORA	♀ ♂	10.3	43	Adult Juv.	P	0 1 2 3		☐	☐	
10	23:55	AA	MYAU	♀ ♂	9.4	—	Adult Juv.	P/L	0 1 2 3		☐	☐	Escapee (JLD)
11	0015	E	MYAU	♀ ♂	8.2	37	Adult Juv.	P/L	0 1 2 3		☐	☐	
12	0013	C	MYAU	♀ ♂	6.6	36	Adult Juv.	P/L	0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: Roanoke River	Site: Site 1	GPS unit: 9	GPS id:
Date: 5/23/18	Team leader: Jesse DeLaCruz	Other personnel: Mike Muthersbaugh	
Cloud cover %: 25%	Precipitation: None; 2130 Thunderstorm	General habitat: See previous	
Start temp. (°C) 25	End temp. (°C) 25	Other comments: Thunder & lightning in distance	
Start wind (Beaufort) 0	End wind (Beaufort) 3		
Start humidity: 78%	End humidity: 100		
Start time: 2015	End time: 2130	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 5			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See previous

See previous

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rev. 7.28.15

Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1 2120		COTO	♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
2 2120		MYAU	♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
3			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
4			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
5			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
6			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

Released Clue to Vendor

RCHN Out 2130

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

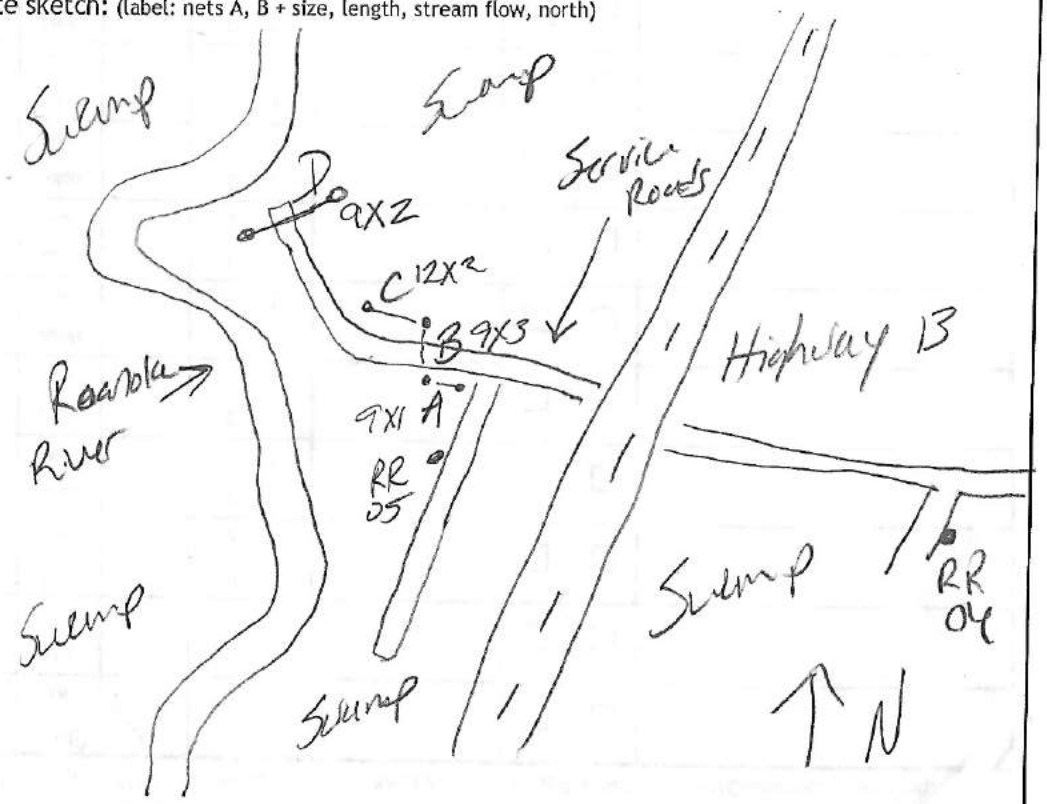
Page #:

Area: Roanoke River NWR	Site: Site 3	GPS unit: 9	GPS id:
Date: 5/24/18	Team leader: Jesse DeLa Cruz	Other personnel: Mike Muthersbaugh	
Cloud cover %: 0	Precipitation: None	General habitat: Swamp	
Start temp. (°C) 22.9	End temp. (°C) 17.5	Other comments: 3/4 moon	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 62%	End humidity: 93%		
Start time: 2010	End time: 00:05		
Number of net sets: 4			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Area is elevated road between flooding drainages. Surrounding area is primarily swamp.

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	22:50	D	MYAU	♀ ♂	8.4	39	Adult Juv.	L	0 1 2 3		☐	☐	
2				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
3				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

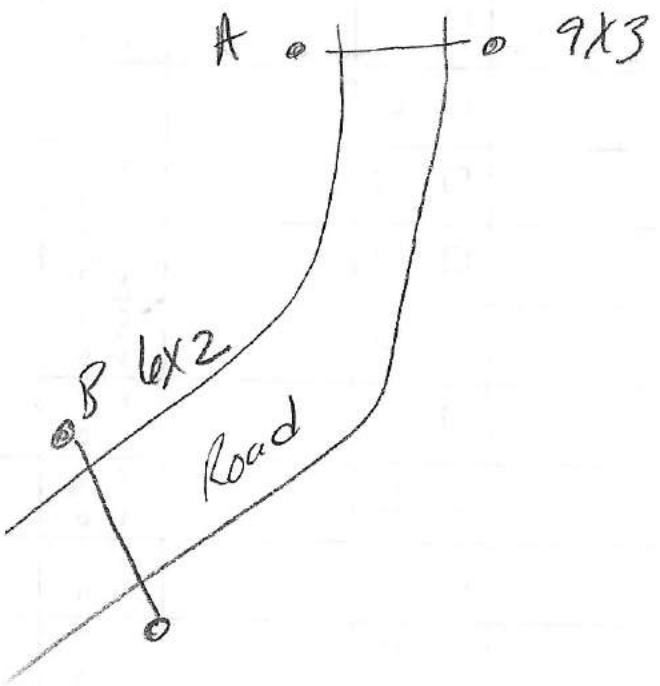
Bat capture data

Page #:

Area: Roanoke River	Site: Site 4	GPS unit: 9	GPS id:
Date: 6/18/18	Team leader: Jesse DeLaCruz	Other personnel: Mike Muthersbaugh	
Cloud cover %: 0	Precipitation: None	General habitat: See Sites 1+2	
Start temp. (°C) 29.1	End temp. (°C) 26.1	Other comments:	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 74%	End humidity: 89%		
Start time: 2045	End time: 0000	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 2			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Sites 1+2



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
2				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
3				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: Alligator River Site: Site 1 GPS unit: 9 GPS id:

Date: 6/19/18 Team leader: Jesse Defenbaugh Other personnel: Mike Mathes Hannah

Cloud cover %: Precipitation: None General habitat:

Start temp. (°C) 31.1 End temp. (°C) 26.6 Other comments: Hot & Humid

Start wind (Beaufort) 0 End wind (Beaufort) 2 Wind picked up & but activity died

Start humidity: 72% End humidity: 83% BEAR!

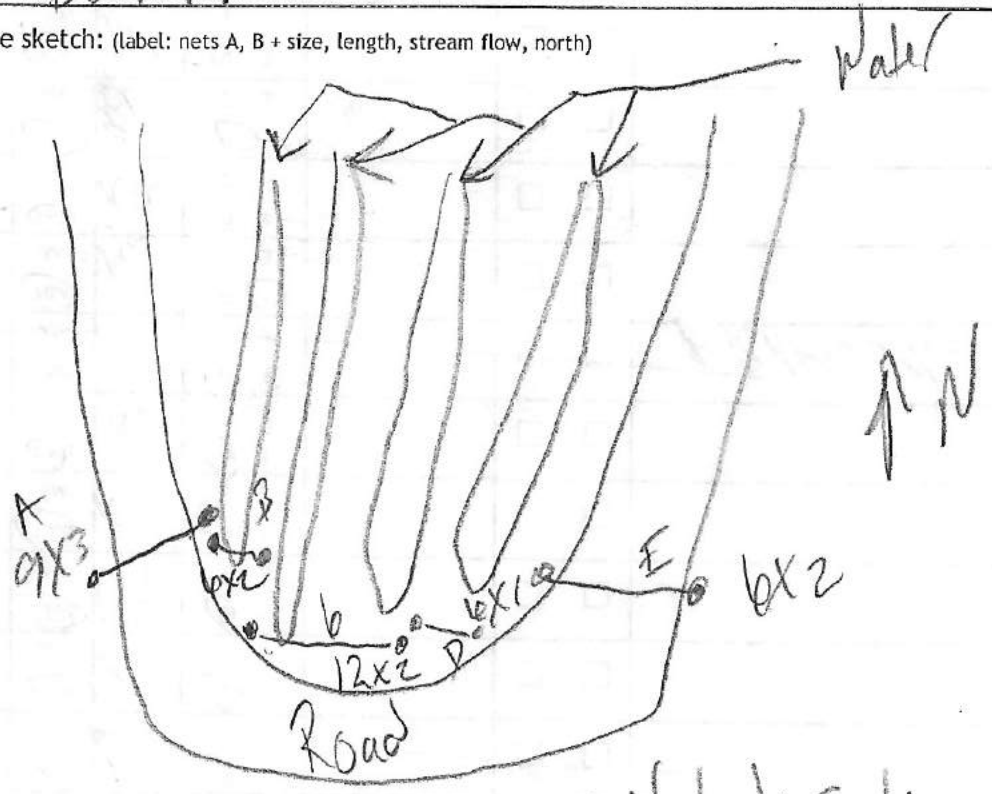
Start time: 2050 End time: 0000

Number of net sets: 5

Site description: (habitat, tree cover around nets, creek condition, etc.)

Area is borrow pit filled with fresh water. Pit is wrapped with road. Five nets set to block roads & ends of pit.

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2035	D	LABO	♀ ♂	13.1	41	Adult Juv.	L	0 1 2 3		☐	☐	
2	2100	A	MYHA	♀ ♂	9.3	36	Adult Juv.	L	0 1 2 3		☐	☐	
3	2100	A	MYHA	♀ ♂	9.2	34	Adult Juv.	NR	0 1 2 3		☐	☐	
4	2100	C	MYHA	♀ ♂	9.6	34	Adult Juv.	NR	0 1 2 3		☐	☐	
5	2100	C	MYHA	♀ ♂	9.0	34	Adult Juv.	NR	0 1 2 3		☐	☐	
6	2100	A	MYHA	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	ESCAPE BAG
7	2105	A	EPFA	♀ ♂	13.9	44	Adult Juv.	NR	0 1 2 3		☐	☐	
8	2145	C	MYHA	♀ ♂	10.6	34	Adult Juv.	NR	0 1 2 3		☐	☐	
9	2205	A	MYHA	♀ ♂	13.1	35	Adult Juv.	[illegible]	0 1 2 3		☐	☐	
10	2205	A	MYHA	♀ ♂	10.4	35	Adult Juv.	NR	0 1 2 3		☐	☐	
11	2205	E	MYHA	♀ ♂	10.1	35	Adult Juv.	NR	0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

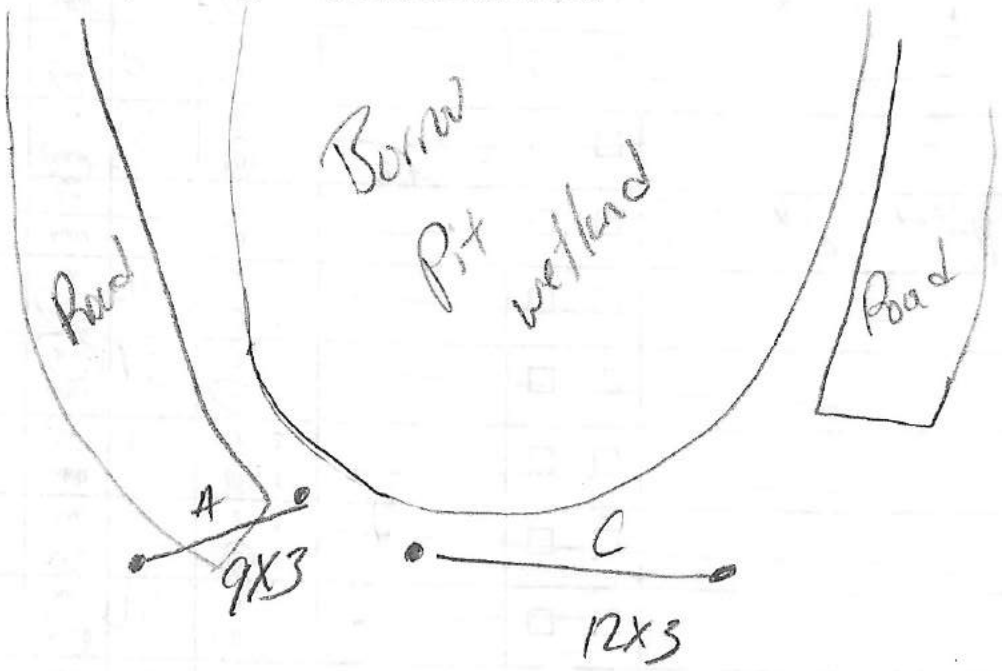
Page #:

Area: Alligator River	Site: Site 01	GPS unit: 9	GPS id:
Date: 8/8/18	Team leader: Jesse De la Cruz	Other personnel: Tomas Nocay	
Cloud cover %: 0%	Precipitation: None	General habitat: Mixed Upland	
Start temp. (°C) 28.3	End temp. (°C) 26.6	Other comments:	
Start wind (Beaufort) 2	End wind (Beaufort) 2		
Start humidity: 87%	End humidity: 93%		
Start time: 2010	End time: 2330		
Number of net sets: 2			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Same as previous from Site 1

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2015	B	NYHU	♀ (♂)	8.7	35	(Adult) Juv.	TD	(0) 1 2 3		☐ ☐	
2	2015	B	NYHU	♀ (♂)	7.1	33	(Adult) Juv.	TD	(0) 1 2 3		☐ ☐	
3	2015	B	NYHU	♀ (♂)	8.0	34	(Adult) Juv.	TD	(0) 1 2 3		☐ ☐	
4	2020	B	LABD	(♀) ♂	10.3	HI	Adult (Juv.)	NR	(0) 1 2 3		☐ ☐	
5	2050	A	LABD	(♀) ♂	8.6	37	Adult (Juv.)	NR	(0) 1 2 3		☐ ☐	
6	2100	B	NYHU	♀ (♂)	10.7	37	(Adult) Juv.	TD	(0) 1 2 3		☐ ☐	
7	2110	B	LABD	(♀) ♂	13.1		Adult Juv.		0 1 2 3		☐ ☐	ESCAPE HAND
8	2110	B	NYHU	♀ (♂)	8.6	34	(Adult) Juv.	TD	(0) 1 2 3		☐ ☐	
9	2130	B	NYHU	(♀) ♂	11.5	36	(Adult) Juv.	PL	(0) 1 2 3		☐ ☐	
10	21:50	A	NYHU	♀ (♂)	9.8	38	(Adult) Juv.	D	(0) 1 2 3	CC2155	☐ ☐	Recap of some sort
11	2245	A	EPFU	♀ (♂)	17.0	43	(Adult) Juv.	NR	(0) 1 2 3		☐ ☐	
12	2305	A	NYHU	(♀) ♂	9.2	34	(Adult) Juv.	PL	(0) 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

B = C

Bat capture data

Page #:

Area: Alligator River	Site: Site 1	GPS unit: 9	GPS id:
Date: 8/9/18	Team leader: Jesse DeLaCruz	Other personnel: Tomas Nocera	
Cloud cover %: 0 %	Precipitation: None	General habitat: Mixed Upland	
Start temp. (°C) 27.2	End temp. (°C) 23.8	Other comments:	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 86 %	End humidity: 94 %		
Start time: 20:10	End time: 23:30	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 2			
Site description: (habitat, tree cover around nets, creek condition, etc.)			

See Previous

See Previous

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rev. 1.6.17

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	20:15	B	PESU	♀ (♂)	5.7	32	(Adult) Juv.	D	0 (1) 2 3		☐ ☐	
2	20:27	A	LASE	(♀) ♂	10.1	42	Adult (Juv.)		(0) 1 2 3		☐ ☐	
3	21:50	B	NYHU	(♀) ♂	10.5	36	(Adult) Juv.	PL	(0) 1 2 3	CC2165	☐ ☐	Recap of same Sept
4	21:50	B	NYHU	♀ (♂)	10.0	37	(Adult) Juv.	D	(0) 1 2 3		☐ ☐	
5	22:20	A	NYHU	(♀) ♂	10.5	35	(Adult) Juv.	PL	(0) 1 2 3		☐ ☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

♀ = C

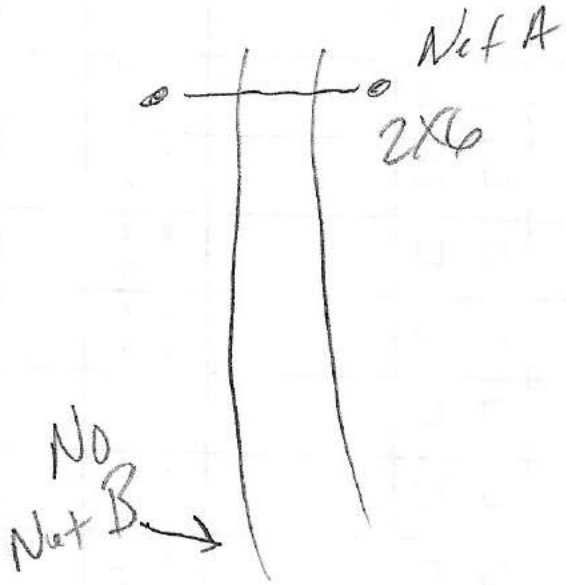
Bat capture data

Page #:

Area: Roanoke River	Site: Site 2	GPS unit: 9	GPS id:
Date: 4/17/19	Team leader: J. De La Cruz	Other personnel:	
Cloud cover %: 0%	Precipitation: None	General habitat: Steep ridge	
Start temp. (°C) 20	End temp. (°C) 16.	Other comments: All nearby water very low	
Start wind (Beaufort) 0	End wind (Beaufort) 1		
Start humidity: 64%	End humidity: 68		
Start time: 19:45	End time: 23:10	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 1			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Lee Ponds



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2130	A	MYAU	♀ ♂	9.7	40	Adult Juv.	NR	0 1 2 3		☐	☐	Nipples bare
2	2132	A	LABO	♀ ♂	9.8	38	Adult Juv.	NR	0 1 2 3		☐	☐	
3				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: Alligator NWR	Site: Site 01	GPS unit: 9	GPS id:
Date: 5/15/19	Team leader: Jesse De La Cruz	Other personnel: MH + JF	
Cloud cover %: 0%	Precipitation: None	General habitat:	
Start temp. (°C) 18.3	End temp. (°C) 16.6	Other comments: Recent brush Clearing & netting by Copperhead Consulting	
Start wind (Beaufort) 2	End wind (Beaufort) 2		
Start humidity: 57	End humidity: 62		
Start time: 2010	End time: 2210	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 2			
Site description: (habitat, tree cover around nets, creek condition, etc.)			

See Previous

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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	8:25	A	LABO	♀ ♂	14.2	39	Adult Juv.	P	0 1 2 3	NA	☐	☐	
2	8:45	A	EPFU	♀ ♂	13.1	43	Adult Juv.	NR	0 1 2 3	NA	☐	☑	general scarring <50% EPFU-m-02
3	8:45	A	LABO	♀ ♂	9.4	36	Adult Juv.	NR	0 1 2 3	NA	☐	☐	
4	9:20	C	NYHU	♀ ♂	15.1	38	Adult Juv.	P	0 1 2 3	NA	☐	☐	HUGE!
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: **P** = pregnant, L = lactating, **PL** = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: Roanoke River Site: site 05 GPS unit: GPS id:

Date: 5/16/19 Team leader: Jesse De la cruz Other personnel: Missy Hahn, Jessica Fitzpatrick

Cloud cover %: 0% Precipitation: No precip. General habitat: bottomland coastal plain forest

Start temp. (°C) 21° End temp. (°C) 18.8 Other comments:

Start wind (Beaufort) 0 End wind (Beaufort) 2

Start humidity: 52% End humidity: 83%

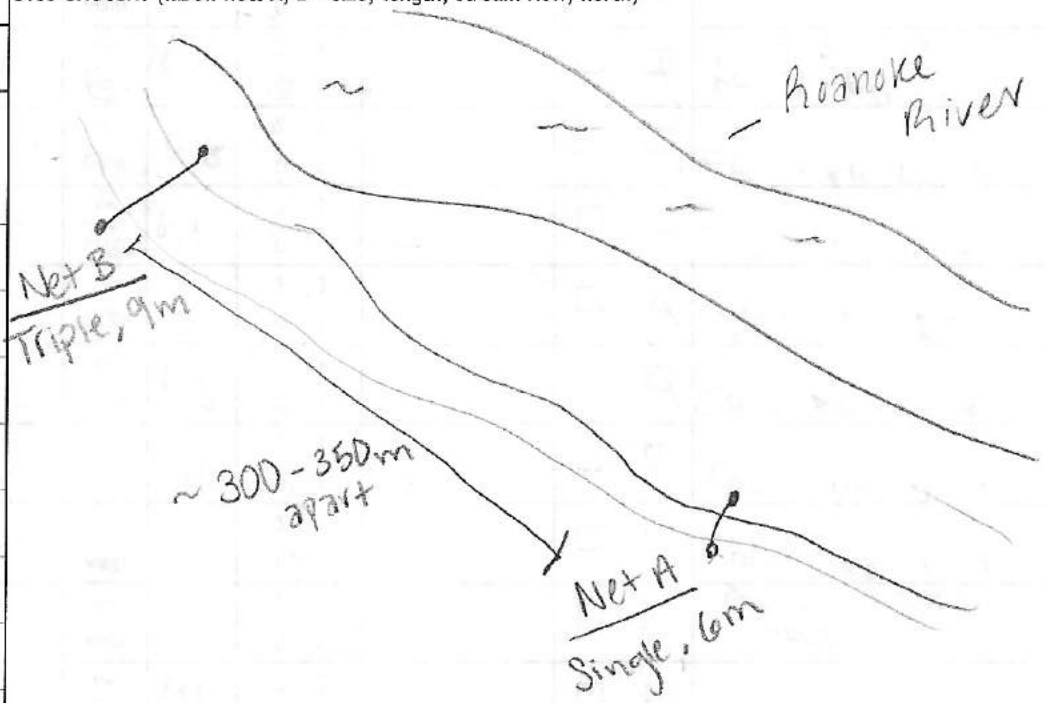
Start time: 20:15 End time: 2245

Number of net sets: 2

Site description: (habitat, tree cover around nets, creek condition, etc.)

- Habitat includes bottomland hardwoods including hackberry, mixture of oaks, maples, understory paw paws ... etc.
- nets are set on gravel road parallel to Roanoke River
- tree cover is dense, with moderate → high canopy cover throughout the forest.

Site sketch: (label: nets A, B + size, length, stream flow, north)



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2040

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	9:00	B	EPFU	♀ ♂	12.6	45	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 1
2	9:00	B	EPFU	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	Escaped from bag before processing
3	9:00	B	EPFU	♀ ♂	11.1	41	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 2
4	9:00	B	EPFU	♀ ♂	13.5	42	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 3
5	9:00	B	EPFU	♀ ♂	13	45	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 4
6	9:00	B	EPFU	♀ ♂	19.1	48	Adult Juv.	P	0 1 2 3		☐	☑	EPFU - RR - F - 1
7	9:00	B	EPFU	♀ ♂	13.2	43	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 5
8	9:00	B	EPFU	♀ ♂	14.5	44	Adult Juv.	NR	0 1 2 3		☐	☑	EPFU - RR - M - 6
9	9:00	B	PESU	♀ ♂	6.0	31	Adult Juv.	NR	0 1 2 3		☐	☑	PESU - RR - M - 1 4-5 wing scars
10	9:00	A	LABO	♀ ♂	12.2	41	Adult Juv.	NR	0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

2045

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

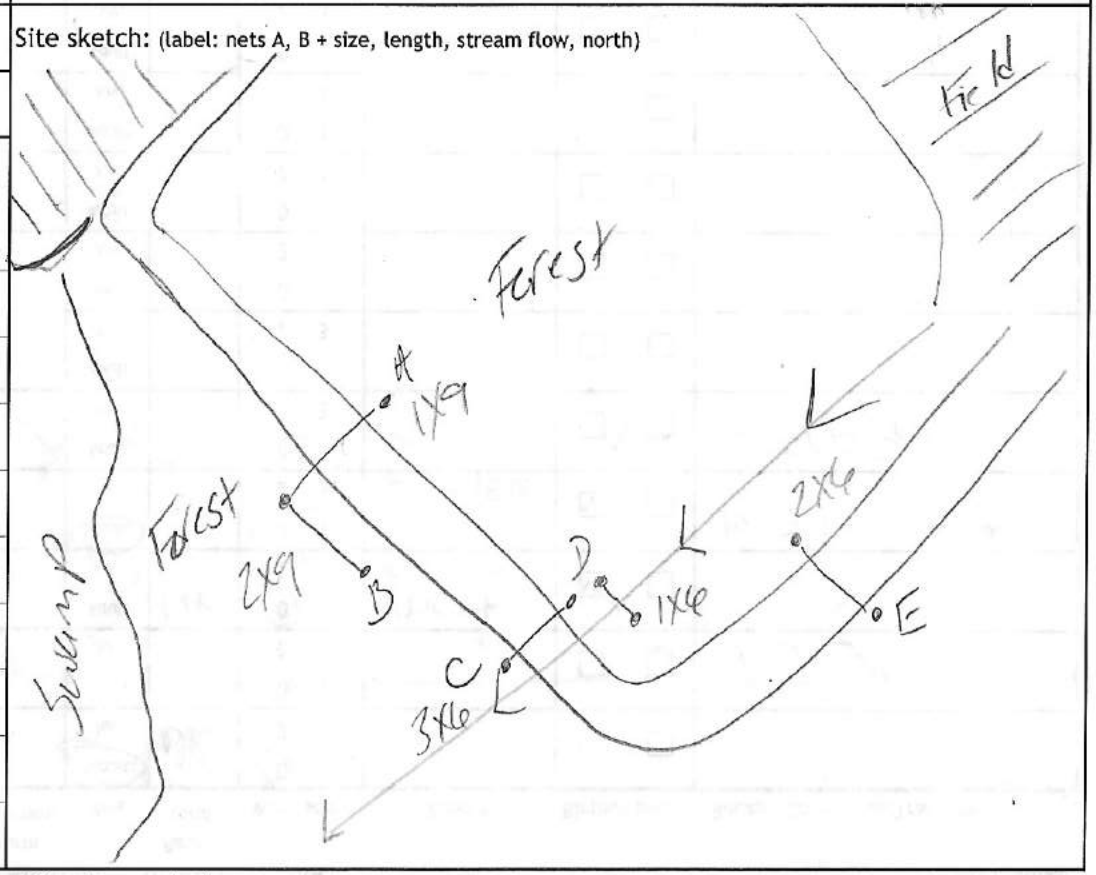
Page #:

Area: North River Game	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/17/19	Team leader: Jesse De La Cruz	Other personnel: Hala Taylor, Mike True, Jay Flowers	
Cloud cover %: 50	Precipitation: None	General habitat: Mixed	
Start temp. (°C) 29	End temp. (°C) 25	Other comments: Thunderstorms to the north & west delayed opening	
Start wind (Beaufort) 0	End wind (Beaufort) 2		
Start humidity: 73%	End humidity: 79%		
Start time: 2045	End time: 0100		
Number of net sets: 5			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Area is very narrow path, adjacent to swamp & ag. field, through hardwood forest

Site sketch: (label: nets A, B + size, length, stream flow, north)



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2120	C	EPFU	♀ ♂	17.4	45	Adult Juv.	NR	0 1 2 3		☐ ☐	
2	2120	D	NYHU	♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	ESCAPE
3	22:20	C	MYSE	♀ ♂	5.25g	35	Adult Juv.	NR	0 1 2 3	VDGIF A50724	☑ ☐	
4	2320	D	MYSE	♀ ♂	7.6g	37	Adult Juv.	L	0 1 2 3	VDGIF A50750	☑ ☐	151.745 "Fredrica"
5	2342	D	MYSE	♀ ♂			Adult Juv.		0 1 2 3		☑ ☑	ESCAPE
6				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

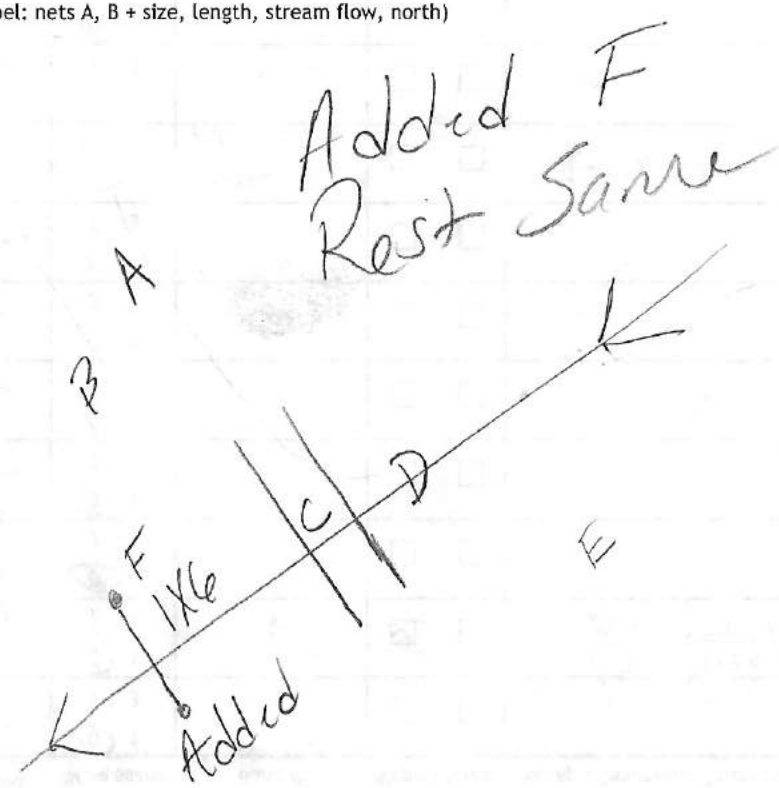
Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/18/19	Team leader: JLD	Other personnel: MT, HT, JF	
Cloud cover %: 25	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 28	End temp. (°C) 23	Other comments:	
Start wind (Beaufort) 0	End wind (Beaufort) 1		
Start humidity: 72	End humidity: 88		
Start time: 2024	End time: 0030	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 6			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous



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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2040	D	PESU	♀ ♂	6.5	35	Adult Juv.	L	0 1 2 3		☐	☐	
2	2102	C	MYSE	♀ ♂	6.10	34	Adult Juv.	L/PL	0 1 2 3	VDGIF A50725	☑	☐	909 (FREQ) A50725 TIFF
3	2104	F	LABO	♀ ♂	12.5	42	Adult Juv.	L	0 1 2 3		☐	☐	
4	2112	A	CORA	♀ ♂	9.5	44	Adult Juv.	L	0 1 2 3		☐	☐	
5	2117	F	CORA	♀ ♂	10.2	42	Adult Juv.	L	0 1 2 3		☐	☐	
6	2226	F	NYHU	♀ ♂	10.00	33	Adult Juv.	L	0 1 2 3		☐	☐	
7	2236	B	LABO	♀ ♂	12.00	39	Adult Juv.	NR	0 1 2 3		☐	☐	
8	23:40	D	MYSE	♀ ♂	6.5	37	Adult Juv.	L	0 1 2 3	VDGIF A50726	☑	☐	FREQ: 549 Sara
9	0020	C	NYHU	♀ ♂	9.9	37	Adult Juv.	NR	0 1 2 3		☐	☐	
10	0020	C	NYHU	♀ ♂	10	34	Adult Juv.	L	0 1 2 3		☐	☐	Miles
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/19/19	Team leader: JD	Other personnel: HT, MT, JF	
Cloud cover %: 75	Precipitation: Rain ~ 30	General habitat: See Previous	
Start temp. (°C) 27	End temp. (°C) 25	Other comments: Bat activity appears suppressed	
Start wind (Beaufort) 2	End wind (Beaufort) 2	Rain Out	
Start humidity: 66	End humidity: 77		
Start time: 2030	End time: 0000	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 6			
Site description: (habitat, tree cover around nets, creek condition, etc.)			

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Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
2			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
3			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
4			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
5			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
6			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15			♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/20/19	Team leader: KD	Other personnel: HT, MT, JF	
Cloud cover %: 50	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 27	End temp. (°C) 25	Other comments: Rained for ~30 mins around 1830	
Start wind (Beaufort) 0	End wind (Beaufort) 2		
Start humidity: 69	End humidity: 64		
Start time: 2020	End time: 0000	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 6			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous

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	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2155	F	MYSE	(♀) ♂	7.5	36	Adult Juv.	L	(0) 1 2 3	Penelope AS0727	☑	☐	(5%) 786
2				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
3				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

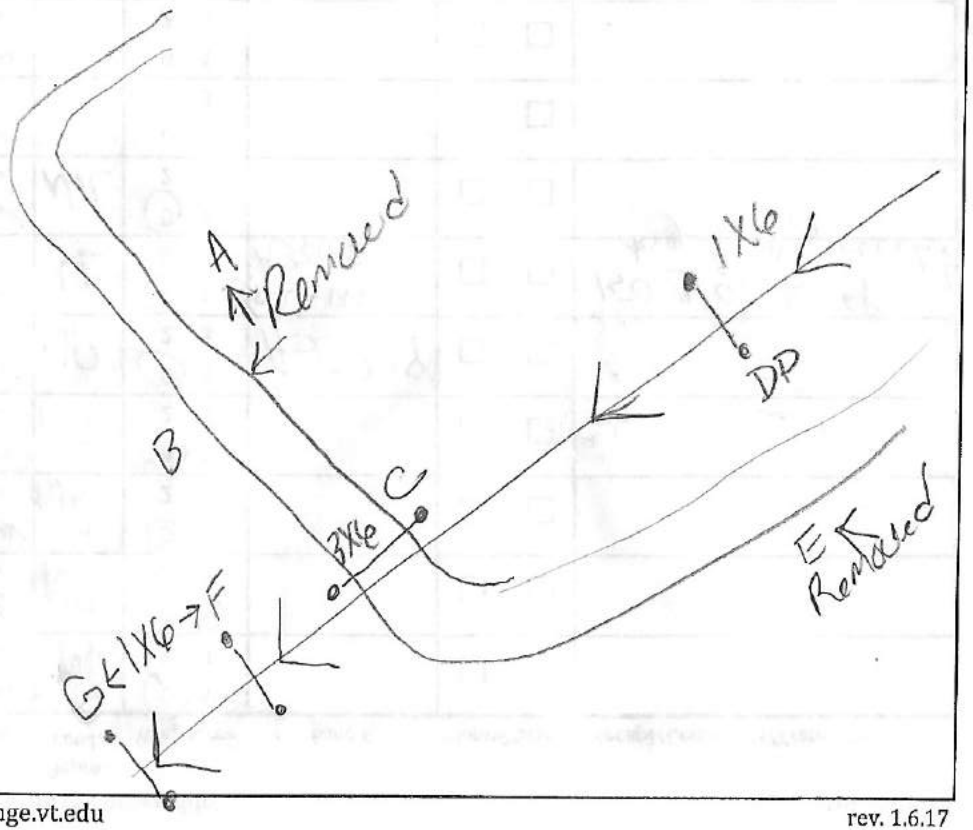
Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/24/19	Team leader: Jesse DeLeCruz	Other personnel: Mike True	
Cloud cover %: 25	Precipitation: None	General habitat: Mixed upland	
Start temp. (°C) 27.7	End temp. (°C) 23	Other comments: Hot + humid - water levels lower	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 74 %	End humidity: 88		
Start time: 2026	End time: 0030		
Number of net sets: 4			

Site description: (habitat, tree cover around nets, creek condition, etc.)

Nets along road have been removed for in favor of a long canal.

Site sketch: (label: nets A, B + size, length, stream flow, north)



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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2123	G	NYHU	♀ (♂)	9.5	36	(Adult) Juv.	NR	(0) 1 2 3		☐ ☐	
2	2123	G	EPFU	♀ (♂)	16.0	48	(Adult) Juv.	NR	0 (1) 2 3		☐ ☐	
3	2148	G	NYHU	♀ (♂)	9.25	35	(Adult) Juv.	NR	(0) 1 2 3		☐ ☐	
4	2148	G	NYHU	♀ (♂)	9.5	35	(Adult) Juv.	NR	(0) 1 2 3		☐ ☐	
5	2240	DD	MYAU	♀ (♂)	7.2	38	(Adult) Juv.	NR	(0) 1 2 3	A50728	☐ ☐	
6	2317	G	MYSE	(♀) ♂	6.8	35	(Adult) Juv.	L	(0) 1 2 3	NC-WRC A3262	☐ ☐	150, 140 Recap forgot wing Rach!
7	2351	G	NYHU	♀ (♂)	9.75	36	(Adult) Juv.	NR	(0) 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/25/19	Team leader: Jesse De La Cruz	Other personnel: Mike True	
Cloud cover %: 0	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 26	End temp. (°C) 23	Other comments: Very calm, warm, & humid	
Start wind (Beaufort) 0	End wind (Beaufort) 0	Perfect night	
Start humidity: 79	End humidity: 81		
Start time: 2025	End time: 2330	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 4		See Previous	
Site description: (habitat, tree cover around nets, creek condition, etc.)			
See Previous			

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2105	F	MYSE	♀ ♂	6.5	36	Adult (Juv.)	NR	(0) 1 2 3	VDGIF A50729	☑	☐	
2	2130	C	MYSE	(♀) ♂	6.75	38	(Adult) Juv.	PL	(0) 1 2 3	NC-WRC A3276	☑	☐	recap; 151,706
3	2138	G	MYSE	♀ (♂)	6.5	35	(Adult) Juv.	NR	(0) 1 2 3	VDGIF A50730	☑	☐	
4	2138	G	MYAL	♀ ♂			Adult Juv.		0 1 2 3		☐	☐	ESCAPE
5	2209	C	MYSE	♀ (♂)	5.5	34	Adult (Juv)	NR	(0) 1 2 3	VDGIF A50731	☑	☐	
6	2215	G	MYSE	(♀) ♂	7.5	36	(Adult) Juv.	L	(0) 1 2 3	VDGIF A50732	☑	☐	151.590
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: North River	Site: Site01	GPS unit: 9	GPS id:
Date: 6/26/19	Team leader: Jesse DeLa Cruz	Other personnel: Mike Tree	
Cloud cover %: 25	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 27	End temp. (°C) 21	Other comments: Night bear #2	
Start wind (Beaufort) 0	End wind (Beaufort) 0	oo! Very calm a "buggy"	
Start humidity: 74%	End humidity: 87		
Start time: 2025	End time: 0140	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 4			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2055	F	PESU	♀ ♂	6.5	34	Adult Juv.	L	0 1 2 3		☐	☐	Tail punctured
2	2135	DD	EPFU	♀ ♂	16.0	46	Adult Juv.	NR	0 1 2 3		☐	☐	
3	2135	DD	EPFU	♀ ♂	Escape		Adult Juv.		0 1 2 3		☐	☐	
4	2247	G	MYAU	♀ ♂	7.0	35	Adult Juv.	NR	0 1 2 3	Forgot!	☐	☐	
5	2247	G	MYAU	♀ ♂	6.5	38	Adult Juv.	L	0 1 2 3	A50733	☐	☐	mites; fresh PL?
6	2325	G	CORA	♀ ♂	9.5	42	Adult Juv.	L	0 1 2 3		☐	☐	
7	2415	G	NYHU	♀ ♂	11	36	Adult Juv.	PL	0 1 2 3		☐	☐	
8	2430	DD	LABO	♀ ♂	13.2	44	Adult Juv.	NR	0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/27/19	Team leader: Jesse DeLeCruz	Other personnel: Mike Tu	
Cloud cover %: 25	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 27.7	End temp. (°C) 24	Other comments: Very hot, humid, & calm	
Start wind (Beaufort) 0	End wind (Beaufort) 0		
Start humidity: 70%	End humidity: 69		
Start time: 2025	End time: 0001	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 4			
Site description: (habitat, tree cover around nets, creek condition, etc.)			

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy?	Swab?	Recap?/Comments/Trans freq.
1	2151	DD	CORA	♀ (♂)	8.75	42	(Adult) Juv.	TD	(0) 1 2 3		☐	☐	Early TD?
2	2231	G	N4H4	(♀) ♂	10.25	35	(Adult) Juv.	L	0 1 2 (3)		☐	☐	Tear in left wing probably not WNS
3				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐	☐	

BAND: Males on RIGHT arm, Females on LEFT.

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Bat capture data

Page #:

Area: North River	Site: Site 01	GPS unit: 9	GPS id:
Date: 6/28/19	Team leader: Jesse DeLeCarlo	Other personnel: Mike True	
Cloud cover %: 25	Precipitation: None	General habitat: See Previous	
Start temp. (°C) 27 (80)	End temp. (°C) 26	Other comments: Over netted site	
Start wind (Beaufort) 0	End wind (Beaufort) 1		
Start humidity: 74%	End humidity: 65		
Start time: 2030	End time: 2230	Site sketch: (label: nets A, B + size, length, stream flow, north)	
Number of net sets: 1			

Site description: (habitat, tree cover around nets, creek condition, etc.)

See Previous

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rev. 7.28.15

	Cap. Time	Net	Species	Sex	Wt. (g)	Forearm length (mm)	Age	Repro. cond.	Wing score	Band #	Biopsy? Swab?	Recap?/Comments/Trans freq.
1	2157	G	MYHU	♀ ♂	9.0	35	Adult Juv.	NR	0 1 2 3		☐ ☐	
2				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
3				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
4				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
5				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
6				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
7				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
8				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
9				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
10				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
11				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
12				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
13				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
14				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	
15				♀ ♂			Adult Juv.		0 1 2 3		☐ ☐	

BAND: Males on RIGHT arm, Females on LEFT.

Reproductive codes: P = pregnant, L = lactating, PL = post lac., NR = non reproductive, U = unknown, D = descended testes (aka. scrotal).

Take Pics!

Bat Roost Tree Measurement Sheet

Bat ID #: 151, 745 Tree ID: 745 01 GPS pt: 36.38006 GPS Unit: 9
Date: 6/18/19 -76.00979

Other tagged bats present (ID #):
none no snakes either... or so we think...

Roost Tree:

Species: Carolina Ash	Dbh (cm): 11.1	Canopy Class: 1 2 3 (4)
Height (ft): 15	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): |cavity| |bark|	Roost height (ft): 2.5	
Densiometer: N: 97 S: 97 E: 95 W: 96	% Bark: 100	Basal area (list area factor of prism): 9 (20)
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 1.42	Dbh (cm): 11.4	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: Caroline ash	Distance to roost (m): 1.30	Dbh (cm): 9.1	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) (4)	Potential roost ht(ft): (|bark|) or |cavity|	
SW quadrant:	Species: Caroline ash	Distance to roost (m): 2.03	Dbh (cm): 8.9	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: Carolina ash	Distance to roost (m): 2.40	Dbh (cm): 7.2	Ht (ft): 15
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): (|bark|) or (|cavity|)	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Bat Roost Tree Measurement Sheet

Bat ID #: 151.549 Tree ID: 549_01 GPS pt: 36.37918 -76.01226 GPS Unit: 9
Date: 6/19/19

Other tagged bats present (ID #): None

Roost Tree:

Species: Red maple	Dbh (cm): 6.2	Canopy Class: 1 2 3 (4)
Height (ft): 12 ft	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 6 ft	
Densiometer: N: 97 S: 97 E: 99 W: 97	% Bark: 100	Basal area (list area factor of prism): 11
Comments:		

Understory description: blueberry Water, very little veg; looks to be milk weed
Midstory description: Young water tupelo

Neighboring Trees:

NE quadrant:	Species: Carolina ash	Distance to roost (m): 1.25	Dbh (cm): 14.5	Ht (ft): 40
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	
SE quadrant:	Species: Carolina ash	Distance to roost (m): 1.875	Dbh (cm): 13.0	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	
SW quadrant:	Species: Carolina ash	Distance to roost (m): 1.0	Dbh (cm): 14.4	Ht (ft): 35
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Carolina Ash	Distance to roost (m): 0.85	Dbh (cm): 18.3	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Take PICS

Bat Roost Tree Measurement Sheet

Bat ID #: 157.745 Tree ID: 745_02 GPS pt: 36.37965 GPS Unit: 9
Date: 6/19/19 -76.08806

Other tagged bats present (ID #):
None

Roost Tree:

Species: American Holly	Dbh (cm): 13.0	Canopy Class: 1 2 3 (4)
Height (ft): 20Ft	Decay stage (circle): 1 2 (3) 4 5 6 7	
Roost type (circle): |cavity| |bark|	Roost height (ft): 8ft	
Densiometer: N: 94 S: 96 E: 96 W: 96	% Bark: 100	Basal area (list area factor of prism): 7
Comments: 1 bat		
Understory description: Swamp bay, river cane		
Midstory description: Water tupelo		

Neighboring Trees:

NE quadrant:	Species: Carolina Ash	Distance to roost (m): 2.2	Dbh (cm): 16.0	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
SE quadrant:	Species: Water tupelo	Distance to roost (m): 3.2	Dbh (cm): 17.0	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
SW quadrant:	Species: Water tupelo	Distance to roost (m): 1.1	Dbh (cm): 12.4	Ht (ft): 40
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Water Oak	Distance to roost (m): 0.45	Dbh (cm): 18.6	Ht (ft): 55
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Tgt 4 P25

Bat Roost Tree Measurement Sheet

Bat ID #: 157.909 Tree ID: 909.01 GPS pt: 36.38115 GPS Unit: 9
Date: 6/19/19 -76.00630

Other tagged bats present (ID #):
3 bats

Roost Tree:

Species: Sweet gum	Dbh (cm): 13.0	Canopy Class: 1 2 (3) 4
Height (ft): 75	Decay stage (circle): 1 2 3 (4) 5 6 7	
Roost type (circle): |cavity| (bark)	Roost height (ft): 20 ft	
Densiometer: N: 94 S: 96 E: 96 W: 96	% Bark: 75	Basal area (list area factor of prism): 7

Comments:

Understory description: Day, river cane, bay, & tupelo
Midstory description: Red maple

Neighboring Trees:

NE quadrant:	Species: Red maple	Distance to roost (m): 1.0.	Dbh (cm): 5.5	Ht (ft): 10
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity| None	
SE quadrant:	Species: Red maple	Distance to roost (m): 3.6	Dbh (cm): 14.4	Ht (ft): 35
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): (bark) or |cavity|	
SW quadrant:	Species: Red maple	Distance to roost (m): 2.3	Dbh (cm): 13.7	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Sweetgum	Distance to roost (m): 2.3	Dbh (cm): 26.0	Ht (ft): 55
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Take Pics

Bat Roost Tree Measurement Sheet

Bat ID #: 151.549 Tree ID: 549_02 GPS pt: 36.37968 GPS Unit: 9
Date: 6/20/19 -74.01024

Other tagged bats present (ID #): none / unknown

Roost Tree:

Species: Water Tupelo	Dbh (cm): 9.5	Canopy Class: 1 2 3 (4)
Height (ft): 15	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 57ft	
Densiometer: N: 97 S: 97 E: 97 W: 95	% Bark: 100	Basal area (list area factor of prism): 16
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 0.74	Dbh (cm): 5	Ht (ft): 10
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or (cavity)	
SE quadrant:	Species: water tupelo	Distance to roost (m): 0.58	Dbh (cm): 13.6	Ht (ft): 40
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): None |bark| or |cavity|	
SW quadrant:	Species: Carolina ash	Distance to roost (m): 1.83 m	Dbh (cm): 9.9	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): None |bark| or |cavity|	
NW quadrant:	Species: water tupelo	Distance to roost (m): 0.75	Dbh (cm): 6.4	Ht (ft): 20
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): None |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Bat Roost Tree Measurement Sheet

Bat ID #: 157,909 Tree ID: 909_02 GPS pt: 36.38141 -76.00948 GPS Unit: 9
Date: 6/20/19

Other tagged bats present (ID #):
Nuc /unk

Roost Tree:

Species: Water Tupelo	Dbh (cm): 12.5	Canopy Class: 1 (2) 3 4
Height (ft): 35	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 12 ft	
Densiometer: N: 97 S: 97 E: 97 W: 95	% Bark: 100	Basal area (list area factor of prism): 16 (20)
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 0.5m	Dbh (cm): 15.8	Ht (ft): 25
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or (|cavity|)	
SE quadrant:	Species: water tupelo	Distance to roost (m): 2.86	Dbh (cm): 8.3cm	Ht (ft): ~~20~~ 15
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 ~~3~~ (4)	Potential roost ht(ft): |bark| or |cavity|	
SW quadrant:	Species: water tupelo	Distance to roost (m): 1.35	Dbh (cm): 24.8	Ht (ft): 50
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: water tupelo	Distance to roost (m): 1.9	Dbh (cm): 13.5	Ht (ft): 25
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: ~~1~~ 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Take BLS

Bat Roost Tree Measurement Sheet

Bat ID #: 151,549 Tree ID: 549_03 GPS pt: 36.38048 GPS Unit: 9
Date: 6/21/19 -76.01128

Other tagged bats present (ID #):

Roost Tree:

Species: swamp bay	Dbh (cm): 18.5	Canopy Class: 1 2 (3) 4
Height (ft): 30	Decay stage (circle): 1 (2) 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 5.5 ft	
Densiometer: N: 50 S: 90 E: 83 W: 94	% Bark: 100	Basal area (list area factor of prism): 8
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: swamp bay	Distance to roost (m): 3.85	Dbh (cm): 13.4	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: swamp bay	Distance to roost (m): 0.7	Dbh (cm): 15.3	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SW quadrant:	Species: red maple	Distance to roost (m): 0.2	Dbh (cm): 21.2	Ht (ft): 35
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: Carolina ash	Distance to roost (m): 3.2	Dbh (cm): 6.9	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Take Pics

Bat Roost Tree Measurement Sheet

Bat ID #: 151, 786 Tree ID: 786 - 1 GPS pt: 36.38098 -76.01336 GPS Unit: 9

Date: 6/21/19

Other tagged bats present (ID #):

786 + Juvenile (Scaped)

Roost Tree:

Species: Water tupelo	Dbh (cm): 8.3	Canopy Class: 1 2 (3) 4
Height (ft): 25 ft	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 3.5 ft	
Densiometer: N: 98 S: 98 E: 96 W: 97	% Bark: 100	Basal area (list area factor of prism): 16
Comments:		
Understory description: several mounds of Ferns & coarse woody debris		
Midstory description: Swamp bay & water tupelo		

Neighboring Trees:

NE quadrant:	Species: Water tupelo	Distance to roost (m): 1.7	Dbh (cm): 9.4	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
SE quadrant:	Species: Water tupelo	Distance to roost (m): 1.75	Dbh (cm): 14.0	Ht (ft): 50
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	
SW quadrant:	Species: Water tupelo	Distance to roost (m): 0.75	Dbh (cm): 6.0	Ht (ft): 15.0
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Water tupelo	Distance to roost (m): 1.3	Dbh (cm): 13.2	Ht (ft): 50
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Take Pics

Bat Roost Tree Measurement Sheet

Bat ID #: 151 - 909 Tree ID: 909_03 GPS pt: 36.38076 -76.00802 GPS Unit: 9
Date: 6/21/19

Other tagged bats present (ID #):

Roost Tree:

Species: Water tupelo	Dbh (cm): 18.8	Canopy Class: 1 (2) 3 4
Height (ft): 35	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 18 ft	
Densiometer: N: 93 S: 97 E: 96 W: 95	% Bark: 100	Basal area (list area factor of prism): 13
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 2.55	Dbh (cm): 11.9	Ht (ft): 20
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: water tupelo	Distance to roost (m): 2.71	Dbh (cm): 6.9	Ht (ft): 15
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity|	
SW quadrant:	Species: water tupelo	Distance to roost (m): 6.4	Dbh (cm): 26.9	Ht (ft): 40
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: water tupelo	Distance to roost (m): 1.2	Dbh (cm): 18	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Take Pics

Bat Roost Tree Measurement Sheet

Bat ID #: 150, 140 Tree ID: 140-1 GPS pt: 36.37952, -76.01038 GPS Unit: 9
Date: 6/25/19

Other tagged bats present (ID #): Unknown ♀ lost 6/24/19

Roost Tree:

Species: Sweetgum	Dbh (cm): 23.2	Canopy Class: 1 2 (3) 4
Height (ft): 23 ft	Decay stage (circle): 1 2 3 (4) 5 6 7	
Roost type (circle): |cavity| (|bark|)	Roost height (ft): 18 ft	
Densiometer: N: 94 S: 100 E: 96 W: 97	% Bark: 75%	Basal area (list area factor of prism): 12 (10)
Comments:		
Understory description: Ash, sweet gum, milk weed		
Midstory description: water gum, swamp bay		

Neighboring Trees:

NE quadrant:	Species: Carolina Ash	Distance to roost (m): 1.3	Dbh (cm): 23.5	Ht (ft): 55
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| NT	
SE quadrant:	Species: water gum	Distance to roost (m): 1.3	Dbh (cm): 8.5	Ht (ft): 12 ft
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity| NA	
SW quadrant:	Species: Carolina Ash	Distance to roost (m): 0.43	Dbh (cm): 35.9	Ht (ft): 55
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or (|cavity|)	
NW quadrant:	Species: Sweetgum	Distance to roost (m): 2.2 m	Dbh (cm): 20.2	Ht (ft): 50 ft
	Decay Stage: (4) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity| NA	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Tale Pus

Bat Roost Tree Measurement Sheet

Bat ID #: 151 706 Tree ID: 706-1 GPS pt: 36.37952 GPS Unit: #9
Date: 6-26-19 -76.01196

Other tagged bats present (ID #):
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Roost Tree:

Species: Carolina Ash	Dbh (cm): 9 cm	Canopy Class: 1 2 (3) 4
Height (ft): 30	Decay stage (circle): 1 2 (3) 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 3	
Densiometer: N: 95.7 S: 94.64 E: 93.6 W: 95.64 (4 5 C 4)	% Bark: 100	Basal area (list area factor of prism): 13
Comments:		
Understory description: Calf deep water - snakes present		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 2.75	Dbh (cm): 7.9	Ht (ft): 25
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: Swamp bay	Distance to roost (m): 2.23	Dbh (cm): 36.4	Ht (ft): 40
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): (|bark|) or (|cavity|)	
SW quadrant:	Species: water tupelo	Distance to roost (m): 1.10	Dbh (cm): 16.9	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: Sweet gum	Distance to roost (m): 1.26	Dbh (cm): 14.7	Ht (ft): 45
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Take Pics

Bat Roost Tree Measurement Sheet

Bat ID #: 154590 Tree ID: 640 01 GPS pt: 36.37990 -76.01086 GPS Unit: 9
Date: 6/26/19

Other tagged bats present (ID #):

Roost Tree:

Species: Water tupelo	Dbh (cm): 13.5	Canopy Class: 1 2 (3) 4
Height (ft): 25	Decay stage (circle): (1) 2 3 4 5 6 7	
Roost type (circle): (cavity) |bark|	Roost height (ft): 12 ft	
Densiometer: N: 98 S: 100 E: 93 W: 100	% Bark: 100	Basal area (list area factor of prism): 9 (20)
Comments:		

Understory description: River cane, sedges, low water 9 (20)
Midstory description: excess of water tupelo & red maple

Neighboring Trees:

NE quadrant:	Species: Red maple (snag)	Distance to roost (m): 3.5	Dbh (cm): 21.3	Ht (ft): 45
	Decay Stage: 1 2 (3) 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or (cavity)	
SE quadrant:	Species: Water tupelo	Distance to roost (m): 2.0	Dbh (cm): 9.9	Ht (ft): 12ft
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity| None	
SW quadrant:	Species: Water tupelo	Distance to roost (m): 1.2	Dbh (cm): 7.1	Ht (ft): 18
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Water tupelo	Distance to roost (m): 2.05	Dbh (cm): 13.4	Ht (ft): 30
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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Bat Roost Tree Measurement Sheet

Bat ID #: 151.590 Tree ID: 590-2 GPS pt: 36.37968 -76.01054 GPS Unit: #9
Date: 6/27/19

Other tagged bats present (ID #):
No others but veeeery snake-y !

Roost Tree:

Species:	Dbh (cm):	Canopy Class: 1 2 (3) 4
Swamp bay	12.6	
Height (ft):	Decay stage (circle): (1) (2) 3 4 5 6 7	
30		
Roost type (circle): (cavity) |bark|	Roost height (ft):	
	15	
Densiometer: N: S: E: W:	% Bark:	Basal area (list area factor of prism):
90 94 96 85	100	13
Comments:		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 2.74	Dbh (cm): 8.9	Ht (ft): 25
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: water tupelo	Distance to roost (m): 1.9	Dbh (cm): 30.3	Ht (ft): 50
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): |bark| or |cavity|	
SW quadrant:	Species: Carolina ash	Distance to roost (m): 1.1	Dbh (cm): 6.1	Ht (ft): 15
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: red maple	Distance to roost (m): 1.32	Dbh (cm): 12.8	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) (4)	Potential roost ht(ft): (|bark|) or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Bat Roost Tree Measurement Sheet

Bat ID #: 151, 706 Tree ID: 706-02 GPS pt: 36.38113 -76.00761 GPS Unit: 9
Date: 6/27/19

Other tagged bats present (ID #):

Roost Tree:

Species: Carolina ash	Dbh (cm): 13.2	Canopy Class: 1 2 (3) 4
Height (ft): 20 ft	Decay stage (circle): 1 2 3 (4) 5 6 7	
Roost type (circle): |cavity| |(bark)|	Roost height (ft): 16	
Densiometer: N: 87 S: 58 E: 74 W: 84 (Needs work)	% Bark: 40	Basal area (list area factor of prism): 8
Comments: Several snags in area; very close to wetland edge open & hot		
Understory description: Sedges & cypress		
Midstory description: Cypress & Juvi tupelo w/ some Red maple		

Neighboring Trees:

NE quadrant:	Species: Carolina Ash	Distance to roost (m): 1.35	Dbh (cm): 9.1	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	
SE quadrant:	Species: Carolina ash	Distance to roost (m): 1.7	Dbh (cm): 36.1	Ht (ft): 45
	Decay Stage: 1 2 3 (4) 5 6 7	Crown class: 1 (2) 3 4	Potential roost ht(ft): (bark) or |cavity|	
SW quadrant:	Species: Red maple	Distance to roost (m): 2.4	Dbh (cm): 16.3	Ht (ft): 15
	Decay Stage: (1) 2 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity| None	
NW quadrant:	Species: Sweetgum	Distance to roost (m): 1.15	Dbh (cm): 12.5	Ht (ft): 72ft
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity| None	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

If this sheet is found please contact Mark Ford: 540-231-5927 | wmford@vt.edu | Virginia Polytechnic Institute

Bat Roost Tree Measurement Sheet

Bat ID #: 706-3 Tree ID: 706-3 GPS pt: 36.38092 -76.00749 GPS Unit: #9

Date: 6/28/19

Other tagged bats present (ID #):

Roost Tree:

Species: red maple	Dbh (cm): 18.8	Canopy Class: 1 ~~2~~ (3) 4
Height (ft): ~~30~~ 25	Decay stage (circle): 1 2 3 (4) 5 (6) 7	
Roost type (circle): |cavity| (|bark|)	Roost height (ft): 10-20 ?	
Densiometer: N: 85 S: 89 E: 95 W: 97	% Bark: 60	Basal area (list area factor of prism): 9
Comments: edge of swamp, very much more open — hot!		
Understory description:		
Midstory description:		

Neighboring Trees:

NE quadrant:	Species: water tupelo	Distance to roost (m): 1.06	Dbh (cm): 9	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
SE quadrant:	Species: water tupelo	Distance to roost (m): 0.40	Dbh (cm): 7.3	Ht (ft): 15
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 3 (4)	Potential roost ht(ft): |bark| or |cavity|	
SW quadrant:	Species: Swamp bay	Distance to roost (m): 1.35	Dbh (cm): 6.3	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	
NW quadrant:	Species: red maple	Distance to roost (m): 0.26	Dbh (cm): 13.4	Ht (ft): 20
	Decay Stage: 1 (2) 3 4 5 6 7	Crown class: 1 2 (3) 4	Potential roost ht(ft): |bark| or |cavity|	

Canopy Class: 1=emergent, 2=dominant, 3=mid-story, 4=suppressed

Decay Stage: 1=alive, 2=declining, 3=dead, 4=loose bark, 5=clean, 6=broken top, 7=stump

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