

APPENDIX F

Summer Woodland Bat Survey -
Indiana Bat

Rockland County, New York

Summer Woodland Bat Survey Patrick Farm



August 8 - 9, 2008

Bat Conservation and Management, Inc.
Carlisle, Pennsylvania

Summer Woodland Bat Survey Patrick Farm

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*Cover:
Triple-high mist nets at site 1*

Summer Woodland Bat Survey

Patrick Farm

August 8-9, 2008

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General Sampling Location



City of Ramapo, Rockland County, New York

Figure 1

Executive Summary

The objective of this study was to provide an inventory of summer bat species occurring in the vicinity of the proposed Patrick Farm development. Bat Conservation and Management, Inc. (BCM) of Carlisle, Pennsylvania conducted a summer mist net survey meeting the protocols set forth in the United States Fish and Wildlife Service Indiana Bat Revised Recovery Plan. Based on the acreage of the proposed development and the portion of the acreage with suitable bat roost habitat, two (2) sites were selected for summer mist net surveys.

A total of eleven (11) bats of four (4) species were captured; including five (5) little brown bats (*Myotis lucifugus*), three (3) big brown bats (*Eptesicus fuscus*), two (2) Northern myotis (*Myotis septentrionalis*), and one (1) Eastern red bat (*Lasiurus borealis*). No federally endangered species were captured.

Introduction

Background

Patrick Farm consists of a proposed 200-acre development located in Rockland County, New York. The proposed development is considered to be within the summer range of the Indiana bat (*Myotis sodalis*); therefore, to satisfy compliance requests by the United States Fish and Wildlife Service (USFWS), a summer mist net survey was carried out following USFWS approved protocols.

Objective

The objective of this study was to provide an inventory of summer bat species occurring in the vicinity of the development. BCM conducted a summer mist net survey meeting the protocols set forth in the United States Fish and Wildlife Service Indiana Bat Revised Recovery Plan.

Indiana Bat

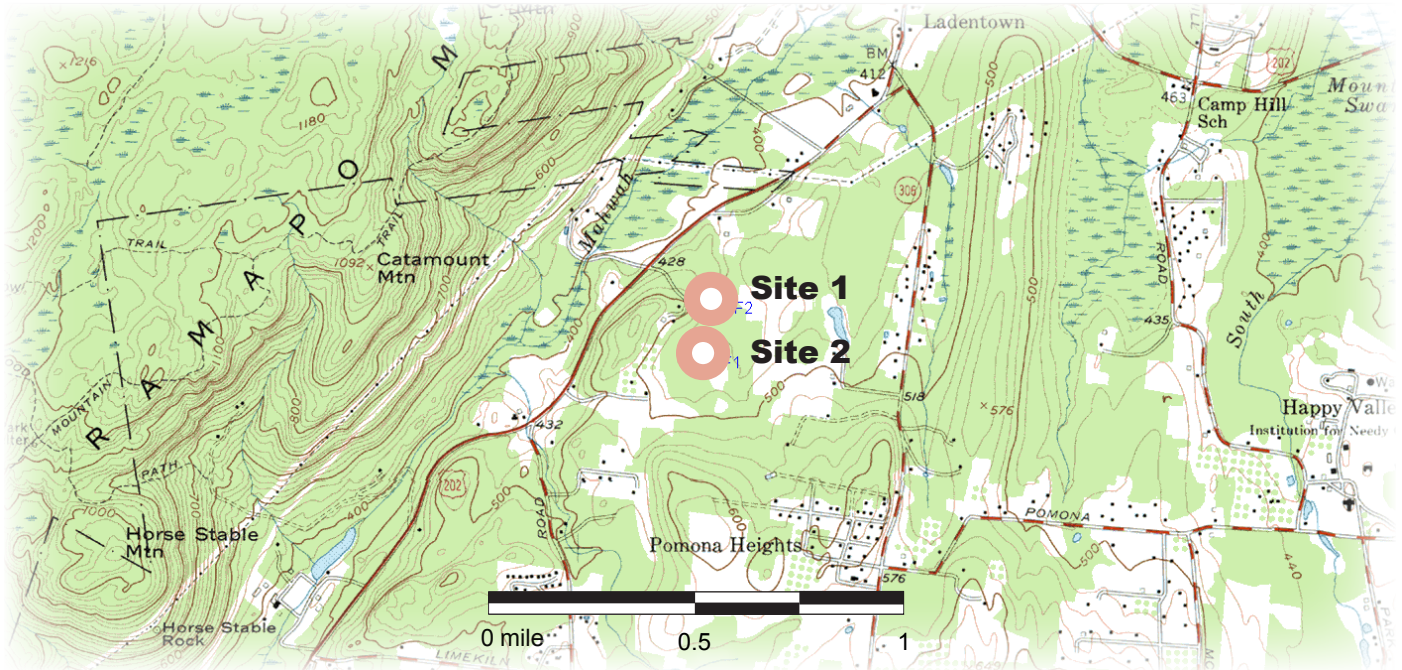
The Indiana bat is a rare woodland bat species with documented occurrences in New York and all adjoining states; however, little survey data is available for this species. Indiana bats hibernate in caves and abandoned deep mines during the winter months (November-March), and use a variety of upland, wetland, and riparian habitats during the spring, summer, and fall. Female Indiana bats form nursery colonies under the exfoliating bark of a variety of tree species. Land clearing may adversely affect roosting bats or the quality of foraging habitat. In order to protect suitable habitat, periodic surveys for these individuals are needed. The USFWS typically requests that the site developer conduct a summer Indiana bat survey between May 15 and August 15. Hibernating Indiana bats have been well-documented in New York, New Jersey, and Pennsylvania abandoned mines.

Table 1: Site Co-ordinates

Trap Site	Latitude	Longitude	Elevation
1	41° 10' 24.2"	74° 04' 39.8"	462'
2	41° 10' 31.1"	74° 04' 37.8"	450'

NAD 27 datum

Figure 2: Survey Locations



Property boundaries are approximate; for detailed, updated maps, contact the developer.

Table 2: Net Night Level of Effort

Trap type	Site 1	Site 2	Totals
Triple-high	4	4	8
Totals	4	4	8

One net night is any size or stack of nets stretched between 2 poles.

Methods and Results

Sampling was conducted between August 8 and 9, 2008 and consisted of two (2) trap sites sampled for two nights each. Each site contained two mist net locations (Table 2). The total inventory effort at this site met the recommendations outlined by the United States Fish and Wildlife Service Indiana Bat Revised Recovery Plan (Appendix C).

The sites were sampled using traditional mist net trapping techniques. Mist nets were manufactured by Avinet, Inc. of Dryden, NY (38mm mesh - nylon, reduced bag, 50/2, 38mm mesh, 2.6m high, 4 shelves). Nets can be set at different heights according to specific site conditions. "Single-high" nets are simple 2.6-meter high nets between two poles. "Double-high" nets are slightly more complicated with two 2.6 meter high nets stacked between two poles. "Triple-high" nets consist of three 2.6 meter high nets stacked between two poles. Triple-high nets were chosen to be most appropriate for all sites. The net lengths were also dictated by the physical characteristics of the site and were up to 9 meters long. Nets were placed over existing roads trails. Nets blocked the majority of the travel-way in the area of sampling.

A net-night was defined as any configuration of mist net length and height between two poles set up for one night. Net-night level of effort totaled eight (8) net-nights (Table 2) consisting of triple-high mist nets. The recommended level of effort for two sites as described by the Indiana Bat Revised Recovery Plan is eight (8) net-nights (Appendix C). Based on the acreage of the site

and the portion of acreage suitable for summer bat roosts, two (2) mist net sites were determined to sufficiently sample the area for Indiana bats (Table 1). The mist net sites were selected by BCM (Figure 2).

Data collected at each trapping area included detailed net setup diagrams, weather conditions during sampling, and general habitat information. Data recorded on bats included species, sex, age, reproductive status, weight, and net of capture information.

Age classification was determined by degree of ossification of the epiphyseal plates of the finger bones. The reproductive condition of females was noted by abdominal palpation and inspection of mammary glands. The reproductive condition of female bats can be used to determine which species have maternity colonies in the general vicinity of the capture site during summer months. Net data sheets are provided in Appendix A.

Bat captures for this project are summarized in Tables 3 and 4. A total of eleven (11) bats of four (4) species were captured; including five (5) little brown bats (*Myotis lucifugus*), three (3) big brown bats (*Eptesicus fuscus*), two (2) Northern myotis (*Myotis septentrionalis*), and one (1) eastern red bat (*Lasiurus borealis*).

The reproductive condition of female bats is represented in Table 5. High numbers of pregnant, lactating, or post lactating bats suggest that a maternity colony of that species may be nearby.

Table 3: Capture Summary

Sample Site		Total Species	Total Captures
Name	Nights		
Site 1	2	2	2
Site 2	2	3	9
Total			11

Table 4: Mist Net Site Totals

Species		Site 1	Site 2	Totals		
				M	F	
<i>Eptesicus fuscus</i>	M	0	1	1		3
	F	1	1		2	
<i>Lasiurus borealis</i>	M	0	0	0		1
	F	1	0		1	
<i>Myotis lucifugus</i>	M	0	3	3		5
	F	0	2		2	
<i>Myotis septentrionalis</i>	M	0	0	0		2
	F	0	2		2	
Totals		2	9	4	7	11
		11		11		

Table 5: Reproductive Condition of Female Bats

Species		Site 1	Site 2	Totals				
				NR	L	PL	JV	
<i>Eptesicus fuscus</i>	NR	0	0	0				2
	L	0	0		0			
	PL	0	1			1		
	JV	1	0				1	
<i>Lasiurus borealis</i>	NR	0	0	0				1
	L	0	0		0			
	PL	1	0			1		
	JV	0	0				0	
<i>Myotis lucifugus</i>	NR	0	0	0				2
	L	0	0		0			
	PL	0	2			2		
	JV	0	0				0	
<i>Myotis septentrionalis</i>	NR	0	1	1				2
	L	0	0		0			
	PL	0	1			1		
	JV	0	0				0	
Totals		2	5	1	0	5	1	7
		7		7				

NR=non-reproductive, P= pregnant, L=lactating, JV=juvenile

Appendix A

Mist Net Data Sheets

Notes and key to abbreviations used on data sheets

Instructions

All information must be completed each night. Partially complete forms will not be accepted. Completed forms are to be turned in to the Team Leader each morning.

PROJECT: Name of the entire survey project.

SITE#: The number given to every trap site in a separate geographic location. Site # remains the same regardless of how many nights are spent at the same location.

DATE: Pre-midnight date which trapping began.

LONGITUDE/LATITUDE: Coordinates from a GPS receiver.

I.D. BY: USFWS qualified person identifying bats at this site.

MOON AFFECT: Was moon present during survey? If so what phase? Was moonlight illuminating nets? Note times.

NUMBER OF NETS/TRAPS: Description of nets, e.g. A: 3Hx9m, B: 2Hx6m, C: 1Hx9mx12m "L" configuration.

SKY CONDITIONS: General weather conditions and temperature in °F, at start, middle, and end of sampling times.

WIND CONDITIONS: Use Beauford scale and note time.

SITE DESCRIPTION: A general overview of the site, e.g. "Shallow stream with long pools surrounded by deciduous forest with maple, oak, and beech. A small clearing and residence is nearby."

ANDERSON III CODE: Use Level III codes and percentages within 1KM of site. Percentages should total 100%.

DISTURBANCE CODE: List up to three of the most significant disturbances within 500 meters. Include distance to disturbance.

Common name:

Little brown
Big brown
Pipistrelle
Northern longear
Smallfooted
Indiana
Red
Hoary
Silver haired
Townsend's Big-eared
Rafinesque's Big-eared
Evening

Species:

Myotis lucifugus
Eptesicus fuscus
Pipistrellus subflavus
Myotis septentrionalis
Myotis leibii
Myotis sodalis
Lasiurus borealis
Lasiurus cinereus
Lasionycteris noctivagans
Corynorhinus townsendii
Corynorhinus rafinesquii
Nycticeius humeralis

Reproductive condition:

NR= Non Reproductive
PG= Pregnant
L= Lactating
PL= Post Lactating
SCR= Scrotal

Age:

A: Adult
J: Juvenile

Anderson Classification Codes first and second level categories

- 1 **Urban or Built-Up Land**
- 11 Residential
- 12 Commercial Services
- 13 Industrial
- 14 Transportation, Communications
- 15 Industrial and Commercial
- 16 Mixed Urban or Built-Up Land
- 17 Other Urban or Built-Up Land
- 2 **Agricultural Land**
- 21 Cropland and Pasture
- 22 Orchards, Groves, Vineyards, Nurseries
- 23 Confined Feeding Operations
- 24 Other Agricultural Land
- 3 **Rangeland**
- 31 Herbaceous Rangeland
- 32 Shrub and Brush Rangeland
- 33 Mixed Rangeland
- 4 **Forest Land**
- 41 Deciduous Forest Land
- 42 Evergreen Forest Land
- 43 Mixed Forest Land
- 5 **Water**
- 51 Streams and Canals
- 52 Lakes
- 53 Reservoirs
- 54 Bays and Estuaries
- 6 **Wetland**
- 61 Forested Wetlands
- 62 Non forested Wetlands
- 7 **Barren Land**
- 72 Beaches
- 73 Sandy Areas Other than Beaches
- 74 Bare Exposed Rock
- 75 Strip Mines, Quarries, and Gravel Pits
- 76 Transitional Areas
- 77 Mixed Barren Land

DO NOT WRITE IN MARGINS OF DATA SHEETS

Disturbance Codes and Key		
PROXIMITY	TYPE	
1 Disturbance on site	A Dumping	H Unimproved roads
	B Party spot	I Recreation area
2 Disturbance within 100 meters of site	C Buildings	J Mining
	D Agriculture	K Fire
	E Utility rights-of-way	L Clearcut
3 Disturbance 100-500 meters of site	F Railroad rights-of-way	M Insect defoliation
	G Improved roads	N No disturbance

Beauford Wind Scale Codes and Key				
Code	Speed(m/sa)	Description	Land Condition	Comfort
0	0 - 0.5	Calm	Smoke rises	No noticeable wind
1	0.5 - 1.5	Light air	Smoke drifts vertically	
2	1.6 - 3.3	Light breeze	Leaves rustle	Wind felt on face
3	3.4 - 5.4	Gentle breeze	Wind extends	Hair disturbed, clothing flaps
4	5.5 - 7.9	Moderate breeze	Small branches in motion	Hair disarranged, raises dust & loose
5	8.0 - 10.7	Fresh breeze	Small trees w/leaf begin to sway	Force of wind felt on body
6	10.8 - 13.8	Strong breeze	Whistling in telegraph wires	Umbrellas used with difficulty
			large branches in motion	
7	13.9 - 17.1	Near gale	Whole trees in motion	Inconvenience in walking
8	17.2 - 20.7	Gale	Twigs broken from trees	Progress impeded/difficult in gusts

Bat Survey Data Form

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Project: <u>Patrick's Farm</u>		County: <u>Rockland</u>		Site #: <u>1</u>	Night #: <u>1</u>	Site Name: <u>Patrick's Farm - Site 1</u>	Date: <u>8-8-08</u>
Latitude: <u>41° 10' 24.21"</u>			Longitude: <u>74° 04' 39.77"</u>			Datum: <u>NAD27</u>	Elevation: <u>462</u> meters <small>circle: (foot)</small>
Observers: <u>Kyle Ryan, Katie Day, Alex Noel</u>					Actual net open time: <u>8:25pm</u>		Actual net close time: <u>1:25pm</u>
Sky Conditions:	<u>8:25pm, Mostly Cloudy, 16.7°C</u>		<u>11:15pm, Mostly Cloudy, 16.0°C</u>		<u>1:25pm, Mostly Cloudy, 16.4°C</u>		
Wind Description:	<u>0</u>		<u>2</u>		<u>1</u>		
Moon effect: (specify net and effect length if any) <u>None</u>							
Number of nets/traps: <small>(label and include size and configuration)</small> <u>A = 9m x 3h B = 6m x 3h</u>							
Site Description: <small>(net placement, stream data, cover composition, surrounding habitat, dominant species)</small> <u>Nets are placed over an unimproved road. A lake is within 100m of site. Dominant trees include maple, oak, and witch hazel.</u>							
Anderson Level II:	<u>4 1 1</u>		<u>52 2</u>		<u>21 2</u>		
Disturbance codes:	<u>H 1</u>		<u>G 2</u>		<u>C 3</u>		
Remarks: <small>(note rain event time and length, other wildlife, etc.)</small>							

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Project: <u>Patrick's Farm</u>		County: <u>Rockland</u>		Site #: <u>1</u>	Night #: <u>1</u>	Site Name: <u>Patrick's Farm - Site 1</u>	Date: <u>8-8-08</u>			
Time	Species	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
<u>8:45pm</u>	<u>Eptesicus fuscus</u>	<u>JV</u>	<u>F</u>	<u>NR</u>	<u>18.0g</u>	<u>45.7mm</u>	<u>2m</u>	<u>A</u>		<u>1</u>
										<u>2</u>
										<u>3</u>
										<u>4</u>
										<u>5</u>
										<u>6</u>
										<u>7</u>
										<u>8</u>
										<u>9</u>
										<u>10</u>
										<u>11</u>
										<u>12</u>
										<u>13</u>
										<u>14</u>
										<u>15</u>
										<u>16</u>
										<u>17</u>
										<u>18</u>
										<u>19</u>
										<u>20</u>

Bat Survey Data Form

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Project: <u>Patrick's Farm</u>		County: <u>Rockland</u>		Site #: <u>2</u>	Night #: <u>2</u>	Site Name: <u>PF 02</u>		Date: <u>8/9/08</u>							
Latitude: <u>41° 10' 31"</u>			Longitude: <u>74° 04' 37.8"</u>			Datum: <u>NAD 21</u>	Elevation: <u>450</u> circle: feet meters	ID By: <u>Kyle Ryan</u>							
Observers: <u>Doug Raybuck, Alex Noel, Brenna Smith</u>						Actual net open time: <u>8:15pm</u>		Actual net close time: <u>1:15pm</u>							
Sky Conditions: <u>dusk, note time+temp+description. Partly Cloudy + 8:20p + 18.3°C</u>		mid-sample, note time+temp+description: <u>10:50 Partly cloudy 16.1°C</u>				end, note time+temp+description: <u>1:15p + Partly Cloudy 15.4°C</u>									
Wind Description: <u>0</u>		<u>1</u>				<u>2</u>									
Moon effect: (specify net and effect length if any) <u>X</u>				Start: _____ Stop: _____		Camera: _____		Photos: _____							
Number of nets/traps: (label and include size and configuration) <u>A: 9m X 3H B: 12m X 3H</u>															
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) <u>Nets are set up over unimproved road. There is a pond near net A. Deciduous old growth forest is surrounding area. Dom species = maple, birch, oak, tulip tree</u>															
Anderson Level II: <table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td>most common+distance</td><td>14 1</td><td>2nd common+distance</td><td>41 1</td><td>3rd common+distance</td><td>52 1</td></tr></table>										most common+distance	14 1	2nd common+distance	41 1	3rd common+distance	52 1
most common+distance	14 1	2nd common+distance	41 1	3rd common+distance	52 1										
Disturbance codes: <table border="1" style="display: inline-table; border-collapse: collapse;"><tr><td>H</td><td>1</td><td>C</td><td>2</td><td>G</td><td>2</td></tr></table>										H	1	C	2	G	2
H	1	C	2	G	2										
Remarks: (note rain event time and length, other wildlife, etc.)															

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Page 1 of 1

Project: <u>Patrick's Farm</u>		County: <u>Rockland</u>		Site #: <u>2</u>	Night #: <u>2</u>	Site Name: <u>PF 2</u>		Date: <u>8/9/08</u>		
Time	Species	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments/Photo #
	<u>NO BATS CAPTURED</u>									
										1
										2
										3
										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19

Appendix B

Representative Site Photographs



Net Site 1



Net Site 1



Net Site 2



Net Site 2

Appendix C

Indiana Bat Sampling Protocol

Note: These Guidelines are extracted from the April 2007 Draft Revised Indiana Bat Recovery Plan.

RATIONALE

A typical mist-net survey is an attempt to determine presence or probable absence of the species; it does not provide sufficient data to determine population size or structure. Following these guidelines will standardize procedures for mist netting. It will help maximize the potential for capture of Indiana bats at a minimum acceptable level of effort. Although capture of bats confirms their presence, failure to catch bats does not absolutely confirm their absence. Netting effort as extensive as outlined below usually is sufficient to capture Indiana bats if they are present. However, there have been instances in which additional effort yielded detection when the standard effort did not.

Some mist-netting projects will require modification (or clarification) of these guidelines; these situations should be resolved through coordination with the Service Field Office responsible for the state in which your project occurs. Consultation with the Field Office is always recommended, particularly for large-scale netting efforts.

The Service accepts the results of these surveys to determine presence for the purposes of Section 7 consultation. Survey results are valid for at least two years.

NETTING SEASON: May 15 - August 15

May 15-August 15 are acceptable limits for documenting the presence of summer populations of Indiana bats, especially maternity colonies. (However, see Kiser and MacGregor 2005 for precautions regarding early-season surveys between May 15 and June 1, as well as late-season surveys between August 1 and August 15). Capture of reproductive adult females (i.e., pregnant; lactating, or post-lactating) and/or young of the year during May 15-August 15 indicates that a nursery colony is active in the area. Outside these dates, data cannot be used to document the presence or probable absence of summer populations.

EQUIPMENT

Mist nets to be used for Indiana bat surveys should be the finest, lowest visibility mesh commercially available: 1) In the past, this was 1 ply, 40 denier monofilament—denoted 40/1; 2) Currently, monofilament is not available, and the finest on the market is 2 ply, 50 denier nylon denoted 50/2; 3). The finest mesh size available is approximately 38 mm (—1 1/2 in).

No specific hardware is required. There are many suitable systems of ropes and/or poles to hold nets. The system of Gardner et al. (1989) has been widely used. See NET PLACEMENT below for minimum net heights, habitats, and other netting requirements that affect the choice of hardware.

NET PLACEMENT

Potential travel corridors such as streams or logging trails typically are the most effective places to net. Place nets approximately perpendicular across the corridor. Nets should fill the corridor from side to side and from stream (or ground) level up to the overhanging canopy. A typical set is 7 m high consisting of three or more nets stacked on top one another and up to 20 m wide. (Nets of different width may be used as the situation dictates).

Occasionally it may be desirable to net where there is no good corridor. Take caution to get nets up into the canopy. The typical equipment described in the section above may be inadequate for these situations, requiring innovation on the part of the researchers.

Exercise safety precautions when placing nets. Poles and nets should be clear of overhead wires. See Kiser and MacGregor (2005) for additional discussion of net placement.

RECOMMENDED NET SITE SPACING

Stream and other linear corridors — one net site per km (0.6 mi) of stream or corridor.

Non-corridor study areas — two net sites per square km of habitat (equivalent to one net site per 123 acres).

The Service Field Office responsible for the state in which your project occurs should be consulted during survey design to resolve issues related to net site spacing for specific projects.

MINIMUM LEVEL OF EFFORT

Netting at each site should include at least four net nights, consisting of: 1) a minimum of two net locations at each site (at least 30 m apart, especially in linear habitat such as a stream . corridor); and 2) a minimum of two nights of netting (i.e., two net locations for two nights = four net nights per site). A "net night" is defined as one net set up for one night. The sample period should begin at sunset and continue for at least 5 hours (longer sample periods may improve success). For purposes of determining presence or probable absence of Indiana bats, four net nights at a site are not required if Indiana bats are caught sooner (i.e., if Indiana bats are caught on the first night of netting, a second night is not required for purposes of documenting presence).

CHECKING NETS

Each net should be checked approximately every 10 minutes. Some researchers prefer continuous monitoring (with or without an electronic bat detector); care should be taken to avoid noise and movement near the nets if this technique is used. When monitoring the site continuously with a bat detector, bats can be detected immediately when they are captured in the net. Prompt removal from the net decreases stress on the bat and potential for the bat to escape (MacCarthy et al. 2006).

