2011 Camera Trap Survey on the Guthrie-Bancroft Parcel, Colby Hill, Lincoln, Vermont

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Summary

In 2011 camera trapping at the Guthrie-Bancroft parcel on Colby Hill, Lincoln, Vermont, lasted from 5 July to 11 November 2011 for a total of 252 camera trap nights, recording 43 photographs and six videos and documenting seven mammal species, including black bears in all four ecosystems. Eastern Chipmunk (*Tamias striatus)* was recorded for the first time this year by the camera traps. 2011 results are discussed in the context of camera trap results from previous years.

Introduction

In 2011 we continued to monitor medium and large mammal species on the Guthrie Bancroft Parcel on Colby Hill, Lincoln, Vermont, using one analog (Camtrakker) and one digital (Cuddeback) camera throughout the summer and into fall at selected sites in the four ecosystems that are part of the long-term monitoring effort on Colby Hill.

Materials and Methods

Methodology was similar to that used in previous years (Decher 2004, 2005, 2006, 2007). Camera-trapping this year was limited to Ecosystems 1, ES 6, ES 14 and ES 20, the same ecosystems selected for the long-term small mammal monitoring. The two cameras were placed in each of the four ecosystems for at least two weeks in summer and two weeks in fall (Table 1).

Ecosystem	Summer	Fall
ES 1	9 - 26 Aug	10 Oct - 26 Oct
ES 6	5 - 25 July	26 Sep - 10 Oct
ES 14	26 Aug – 12 Sept	12 Sept - 26 Sept
ES 20	25 Jul - 9 Aug	26 Oct – 11 Nov

Table 1: Summer and Fall Sampling Periods in each Ecosystem.

GPS waypoints recorded at each camera location were downloaded from a Garmin 12 GPS receiver using the program Mac GPS Pro 7.1.0 and plotted online on Google maps using the shareware program GPS Visualizer (http://www.gpsvisualizer.com/).

Results and Discussion

In 2011 the film-based camera (Camtrakker) recorded 32 useful photographs, whereas the digital (Cuddeback) camera recorded 11 plus six videos. Eastern Chipmunk (*Tamias striatus*) was added to the list of camera-trapped species this year; however, this species is also readily captured by our small mammal traps (see 2011 small mammal report). The most commonly recorded species were White-tailed Deer (20 images, 2 videos, in 3 ecosystems) and Black Bear (11 images, 2 videos, in all 4 ecosystems).

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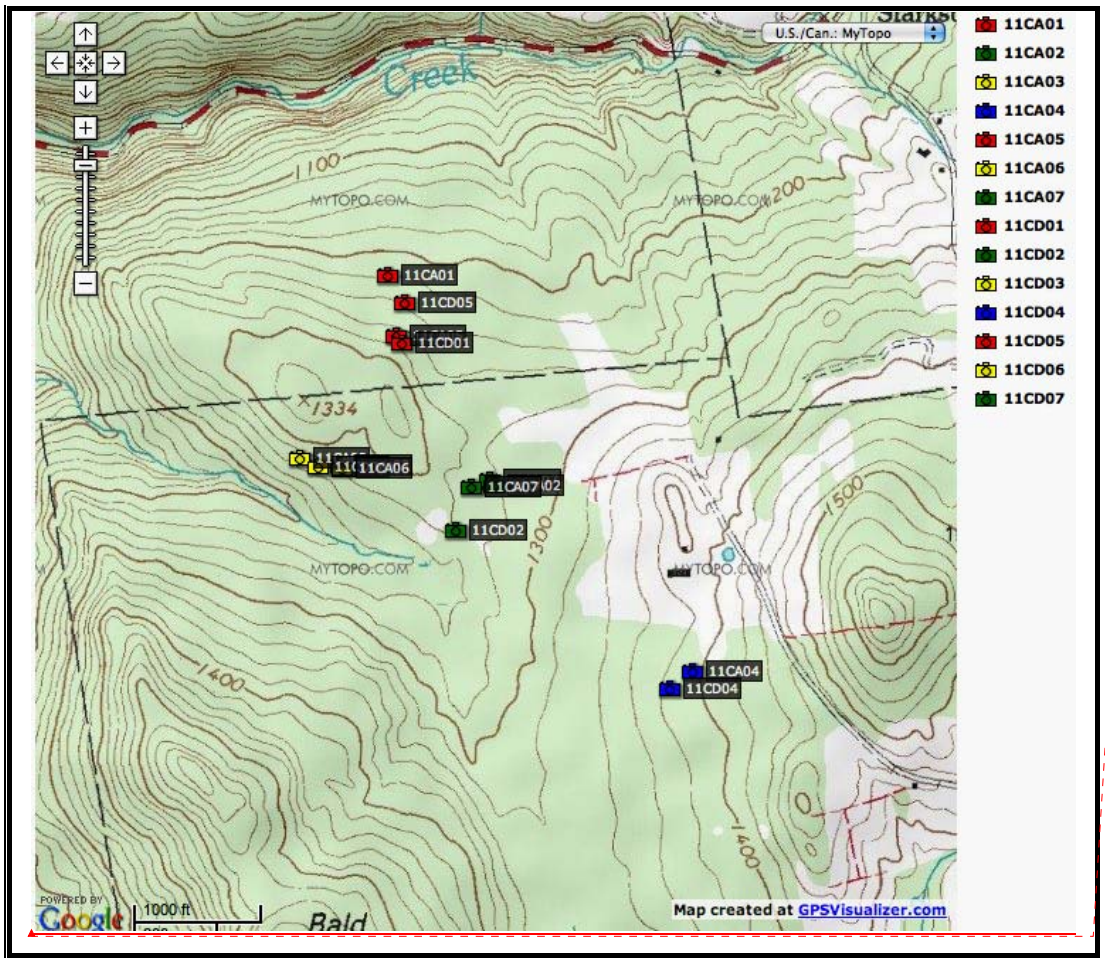

Fig. 1: – 2011 Garmin 12 GPS readings for camera trap locations plotted with GPS Visualizer (http://www.gpsvisualizer.com/) on USGS topographic map of Colby Hill area, Lincoln, Vermont. Legend: Red = ES6, Yellow=ES1, Green = ES20, Blue = ES14. CD = Digital Camera (Cuddeback), CA = Analog Camera (Camtrakker).

Overall trap success was 17.1% (Table 2). The most commonly photographed species this year were White-tailed Deer *(Odocoileus virginanus),* with 20 images from three ecosystems (ES 6, 14, and 20), and Black Bear *(Ursus americanus),* with 10 images from all four sites (Table 1). One image of a Coyote (*Canis latrans*; ES 6), but no other images of canids or other small carnivores (cats, mustelids) were obtained this year. All remaining 13 images were of small mammals (7 chipmunk, 1 Gray Squirrel, 4 Red Squirrel and 1 White-footed/Deer Mouse image).

Table 2: Images and video recorded and number of sites and ecosystems covered with two automatic camera traps on the Guthrie-Bancroft parcel between 5 July and 11 November 2011. Video can only be recorded by the digital (Cuddeback) camera.

Common Name	Scientific Name	ES 1	ES 6	ES 14	ES 20	All	Video
White-tailed Deer	*Odocoileus virginianus*		3	13	4	20	2
Back Bear	*Ursus americanus*	1	1	1	7	10	2
Coyote	*Canis latrans*		1			1	
Eastern Chipmunk	*Tamias striatus*	7				7	2
Gray Squirrel	*Sciurus carolinensis*		1			1	
Red Squirrel	*Tamiasciurus hudsonicus*	4				3	
White-footed/Deer Mouse	*Peromyscus* sp.	1				1	
	Usable Images:	**13**	**6**	**14**	**11**	**43**	**6**
	No of Species:	**4**	**4**	**2**	**2**	**7**	**3**
	Days Sampled:	**34**	**29**	**31**	**32**	**126**	**126**
	Camera Trap Nights:	**66**	**58**	**62**	**64**	**252**	**126**
	Trap Success (trap events/trapnights *100):	**19.7**	**10.3**	**22.6**	**17.2**	**17.1**	**4.8**

As in 2007 the camera station placed along the stonewall in ES 1 (11CA03 and 11CD06) recorded the most species (four) of any station this year, but only one carnivore (Black Bear) compared to five carnivores (Fisher, Raccoon, Mink, Skunk, and Weasel) in 2007 (Tables 3 & 4).

Table 3: 2011 camera trap results for the 7 analog (CA) and 7 digital (CD) camera trap stations used in 2011 with their GPS coordinates and (usable) photo results (Compare Fig. 1)

Camera Station Code	Dates	ES	Latitude	Longitude	W.-t. Deer	Black Bear	Coyote	East. Chipmunk	Gray Squirrel	Red Squirrel	Peroomyscus sp.	Total
11CA01	5-25 July	6	44°09'26.5"	-73°01'37.3"								
11CA02	25 Jul-9 Aug	20	44°09'10.3"	-73°01'25.7"	2	5						7
11CA03	9 – 26 Aug	1	44°09'12.4"	-73°01'46.8"		1		2		3		6
11CA04	26 Aug-26 Sep	14	44°08'56.0"	-73°01'04.1"	13	1						14
11CA05	26 Sep-10 Oct	6	44°09'21.9"	-73°01'36.3"								

11CA06	10 Oct-26 Oct	1	44°09'11.6"	-73°01'42.3"								
11CA07	26 Oct-11 Nov	20	44°09'10.2"	-73°01'28.2"								
11CD01	5-25 July	6	44°09'21.3"	-73°01'35.8"	3	1						4
11CD02	25 Jul-9 Aug	20	44°09'06.9"	-73°01'29.9"	1	2						3
11CD03	9 - 26 Aug	1	44°09'11.9"	-73°01'42.4"								
11CD04	26 Aug–26 Sep	14	44°08'54.7"	-73°01'06.5"								
11CD05	26 Sep-10 Oct	6	44°09'24.4"	-73°01'35.5"			1		1			2
11CD06	10 Oct-26 Oct	1	44°09'11.8"	-73°01'44.9"				5			1	6
11CD07	26 Oct-11Nov	20	44°09'10.8"	-73°01'26.1"	1							1
				Total Images:	20	10	1	7	1	3	1	43

Table 4 (Appendix III, separate EXCEL file) shows all camera trap codes, localities and species documented since 2004, including birds, humans and domestic dogs composing a total of 121 images. The five most commonly recorded species over all five years were White-tailed Deer (n = 35), Moose (n = 12), Fisher (n = 10), Black Bear (n = 17), and Coyote (n = 6).

Species Accumulation Curve

A species accumulation (rarefaction) curve was generated from presence-absence for the camera results from 2004 to 2011 using the program EstimateS (Colwell 2009; Fig. 2).

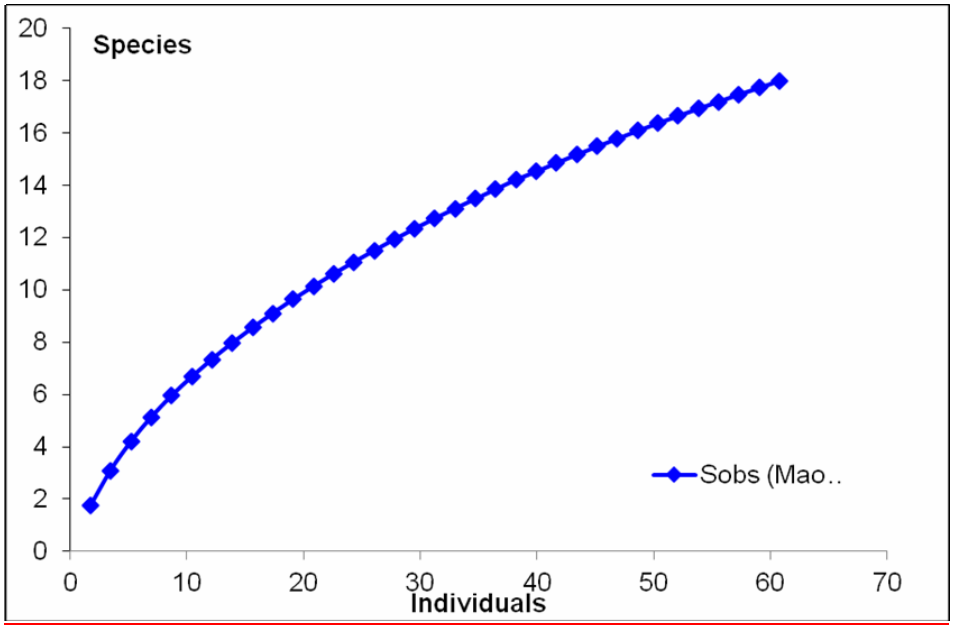

Fig. 2. Individual-based rarefaction curve generated EstimatesS 8.2 (Colwell 2009) using presence-absence data for 18 species (including birds) encountered at Guthrie-Bancroft during five years (2004-2011) of camera trapping.

The curve continues to rise after five years of camera trap sampling with one more species (*Tamias striatus*) added this year and no asymptotic plateau of "species saturation" has been reached.

Increase of Black Bear and White-Tailed Deer Sightings

This year Black Bears were recorded in all four ecosystems with a total of 11 images from five locations. Since 2004 Black Bears were recorded in 12 different locations, most frequently on the edge of ES 20 (old beaver meadow) and in ES 14 (Fig. 3).

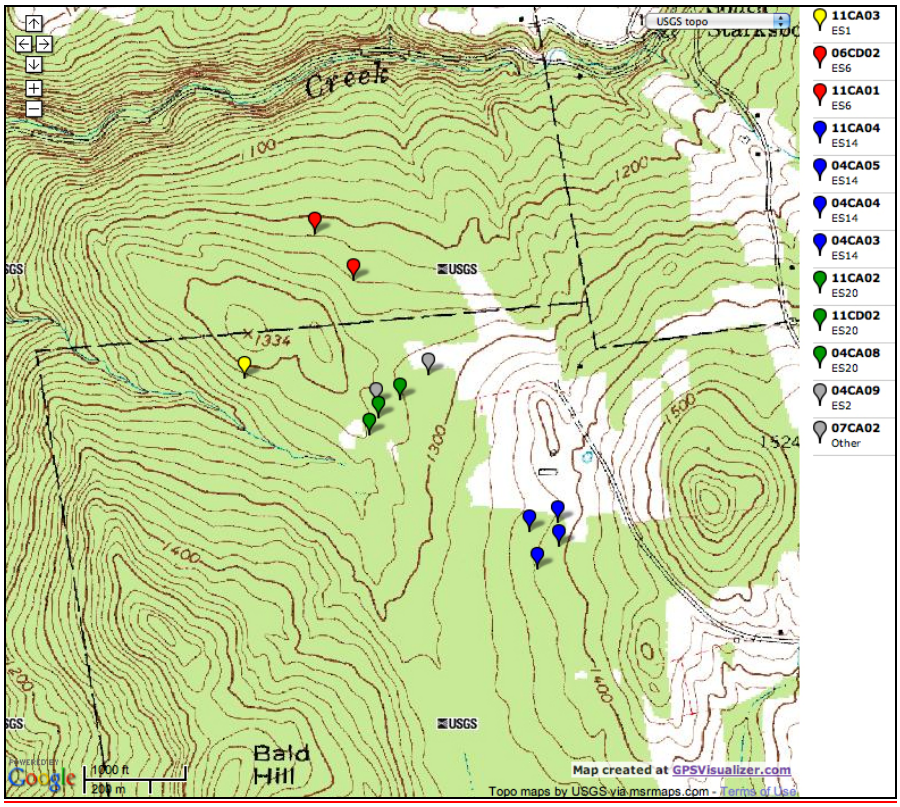

Fig. 3: Map of all Black Bear (*Ursus americanus*) sightings since 2004 plotted with GPS Visualizer (http://www.gpsvisualizer.com/) on USGS topographic map of Colby Hill, Lincoln, Vermont. Legend: yellow = ES1, red = ES6, blue = ES 14, green = ES 20, gray = ES 2 and undetermined. CD = digital camera (Cuddeback), CA = analog camera (Camtrakker).

The 2004-2011 trendlines for the most frequently camera-trapped species (Appendix II; Fig. 4), show the increase of bear images in 2011 and the steady increase in White-tailed deer images since 2004. It would be interesting to find out if Black Bears on the Guthrie-Bancroft parcel are all transient individuals or if a resident population of bears is establishing itself in the greater Colby Hill

area. This could be done with a radio-telemetry study or less expensively so with non-invasive genetic sampling of hair (Beier et al. 2005, Clevenger and Sawaya 2010, Woods et al. 1999). Home ranges reported for Black Bears in the Eastern United States range from to 43 km^2 for males and 15 km^2 for females in Tennessee and North Carolina to 196 km^2 for males and 37 km^2 for females in Pennsylvania (Larivière 2001), areas much larger than the Guthrie-Bancroft Parcel (403 acres of forest, 33 acres of meadow = 1.764 km^2).

White-tailed Deer of all age classes have been recorded in all four ecosystems and beyond (Fig. 4). White-tailed Deer seem very common on the Guthrie–Bancroft parcel and a lack of deer predators or insufficient hunting to control the deer population may affect regeneration of trees (Predl et al. 2008). For example, this year some of the regeneration in the vicinity of the single mature American Chestnut (*Castanea dentata*) tree seemed to be reduced. Among other effects of deer overbrowsing, dense stands of understory ferns, which can suppress the germination and growth of seedlings, may be promoted by intensive deer browsing (De La Cretaz and Kelty 2002, Engelman and Nyland 2006, Horsley et al. 2003, Tremblay et al. 2007). A more quantitative study of forest regeneration on the Guthrie–Bancroft parcel could shed more light on this issue.

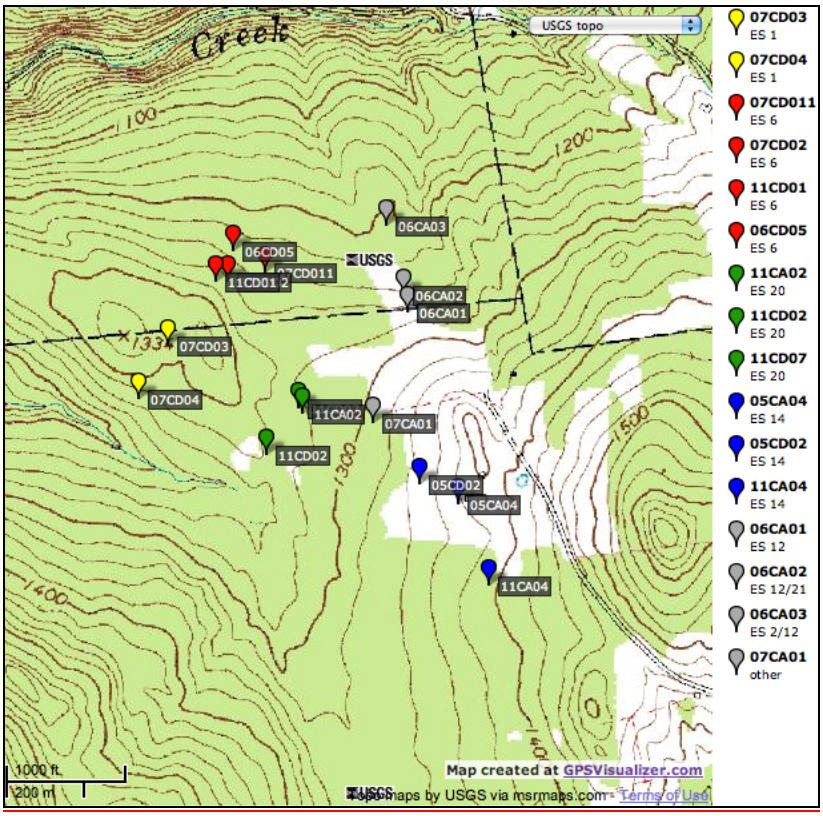

Fig. 4: White-tail Deer locations recorded by the camera traps from 2004 to 2011 and plotted with GPS Visualizer (http://www.gpsvisualizer.com/) on USGS topographic map of Colby Hill, Lincoln, Vermont. Legend: yellow = ES1, red = ES6, blue = ES 14, green = ES 20, gray = other. CD = digital camera (Cuddeback), CA = analog camera (Camtrakker).

Other Wildlife Observations in 2011

North American porcupines (*Erethizon dorsatum*) were not recorded by the camera traps, but two individuals were observed feeding in an apple tree during a trap check on 10 October 2011 (Plate 18). Apples are part of the "summer diet" of porcupines whereas they resort to the bark of trees and evergreen needles in winter (Woods 1973). No Moose (*Alces alces*) were recorded on camera in 2011, however fresh tracks were seen in several places, especially on the trails leading to the old beaver meadow (ES 20).

Acknowledgements

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Appendix I
2011 Selected Camera Trap Photographs

1. Mammals

1.1 Artiodactyls

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Plate 1. *Odocoileus virginanus* (White-tailed Deer). Date: 7 July 2011. Location Code: 11CD01. GPS: 44°09'22.3"N, 73°01'35.8"W Habitat: ES 6 (1/3 pictures from this site)

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Plate 2. *Odocoileus virginanus* (White-tailed Deer). Date: 4 Aug 2011, Location Code: 11CD02. GPS: 44°09'06.9"N, 73°01'29.9"W Habitat: ES 20.

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Plate 3. *Odocoileus virginanus* (White-tailed Deer). Date: 28 Jul 2011. Location Code: 11CA02. GPS: 44°09'10.03"N, 73°01'25.7"W Habitat: ES 20 (1/2 pictures from this site).

Plate 4. *Odocoileus virginanus* (White-tailed Deer). Date: 10 Nov 2011. Location Code: 11CD07. GPS: 44°09'10.08"N, 73°01'26.1"W Habitat: ES 20 .

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Plate 5. *Odocoileus virginanus* (White-tailed Buck). Date: 3 Sep 2011. Location Code: 11CA04. GPS: 44°09'56.0"N, 73°01'04.1"W Habitat: ES14. (1/13 pictures from this site)

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Plate 6. *Odocoileus virginanus* (White-tailed Deer). Date: 16 Sep 2011. Location Code: 11CA04. GPS: 44°09'56.0"N, 73°01'04.1"W Habitat: ES14. (1/13 pictures from this site)

Plate 7. *Odocoileus virginanus* (White-tailed Fawn) Sequence. Date: 12 Sep 2011, Location Code: 11CA04. GPS: 44°09'56.0"N, 73°01'04.1"W Habitat: ES14. (3/13 pictures from this site).

1.2 Carnivores

Plate 8 *Ursus americanus* (Black Bear). Date: 17 Auf 2011. Location Code: 11CA03. GPS: 44°09'12.4"N, 73°01'46.8"W. ES 1 (1/2 pictures from this site)

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Plate 9 *Ursus americanus* (Black Bear). Date: 7 Jul 2011. Location Code: 11CD01. GPS: 44°09'21.3"N, 73°01'35.8"W. ES 6.

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Plate 10 *Ursus americanus* (Black Bear). Date: 1 Sep 2011. Location Code: 11CA04. GPS: 44°09'56.0"N, 73°01'04.1"W. ES14.

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Plate 11 *Ursus americanus* (Black Bear). Date: 4 Aug 2011. Location Code: 11CA02. GPS: 44°09'10.3"N, 73°01'25.7"W. ES20. (1/5 pictures)

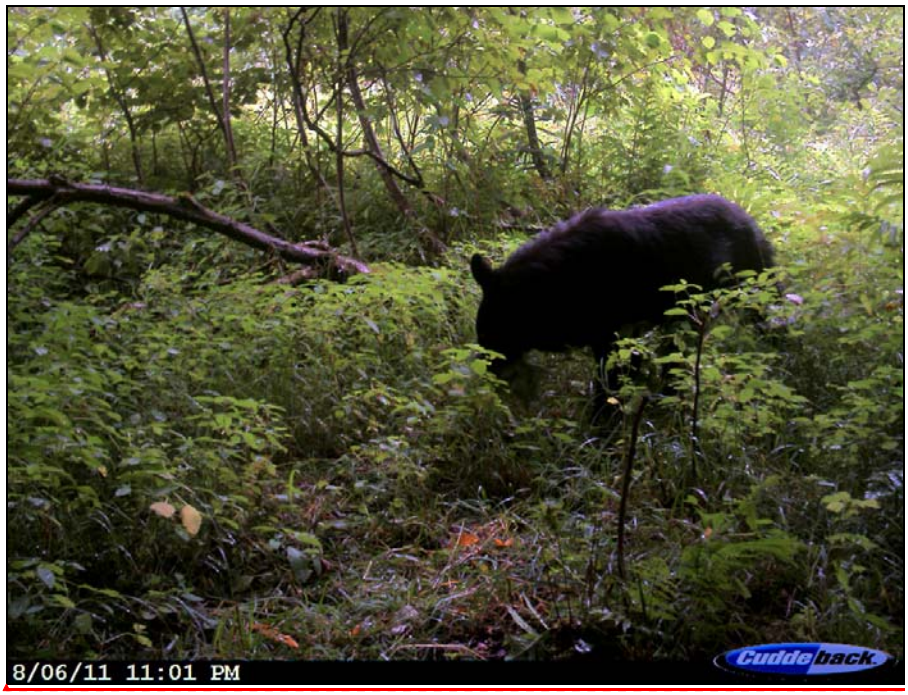

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Plate 12 *Ursus americanus* (Black Bear). Date: 6 Aug 2011. Location Code: 11CD02. GPS: 44°09'06.9"N, 73°01'29.9"W. ES20. (1/2 pictures)

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Plate 13 *Canis latrans* (Coyote). Date: 10 Oct 2011. Location Code: 11CD05.
GPS: 44°09'24.4"N, 73°01'35.5"W. Habitat: ES 6.

1.3 Rodents

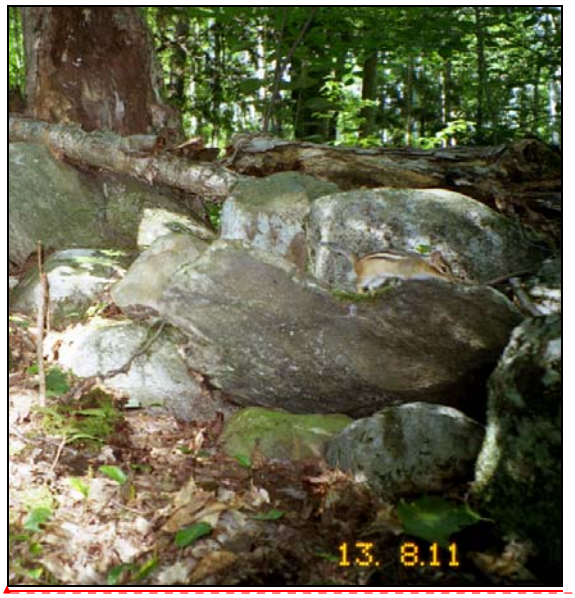

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Plate 14 *Tamias striatus* (Eastern Chipmunk). Date: 13 Aug 2011. Location Code: 11CA03.
GPS: 44°09'11.5"N, 73°01'44.7"W. Habitat: ES 1. (1/2 photos).

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Plate 15. *Sciurus carolinenis* (Gray Squirrel; top right on tree). Date: 9 Oct. 2011. Location Code: 11CD5. GPS: 44°09'24.4"N, 73°01'35.5"W. Habitat: ES 6.

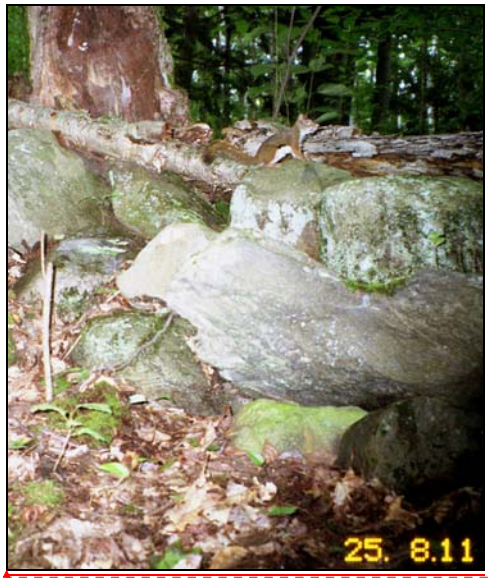

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Plate 16. *Tamiasciurus hudsonicus* (Red Squirrel) Date: 25 Aug.2011. Location Code: 11CA03. GPS: 44°09'12.4"N, 73°01'46.8"W. Habitat: ES 6. (1/3 pictures).

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Plate 17. *Peromyscus sp.* (White-footed or Deer Mouse; top , left of center) Date: 23 Oct. 2011. Location Code: 11CD06. GPS: 44°09'11.8"N, 73°01'44.9"W. Habitat: ES 6.

Other 2011 Wildlife Photograph

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Plate 18. *Erethizon dorsatum* (North American Porcupine) one of two porcupines feeding in an apple tree and in the meadow at the top of the tongue extension area (entrance to "pot trail"). Photographed on 10 Oct 2011 with Canon Rebel T1i SLR camera and 18-55mm lens.

Appendix II
2004-2011 Trendlines for the more frequently camera-trapped species

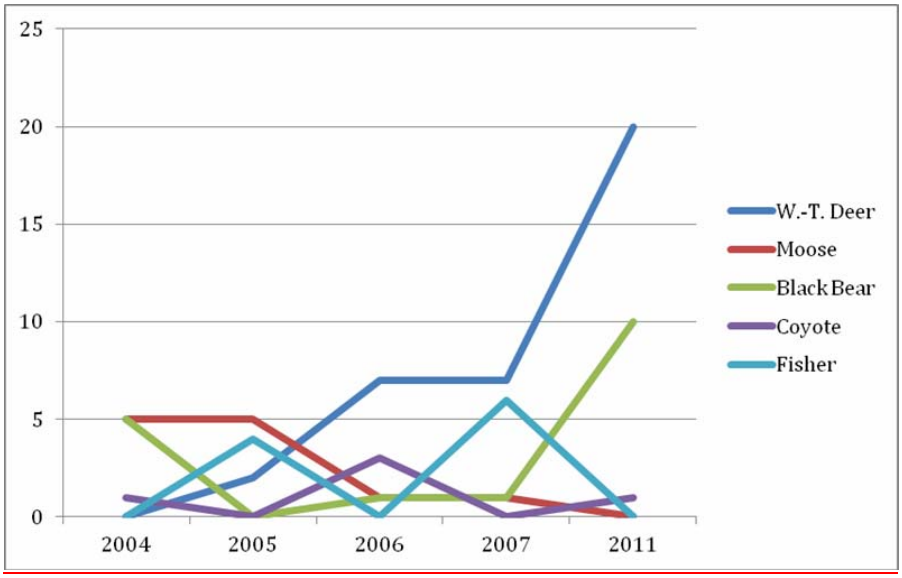

Fig 4. 2004-2011 camera trap codes, localities and all species documented.

Appendix III

Table 4: 2004 - 2011 camera trap GPS localities and results (see also separate EXCEL file).

					Mammals															Birds				
GPS Code	Date	ES	Latitude	Longitude	Bear	Fisher	W.-T. Deer	Moose	Raccoon	Skunk	Mink	Weasel	Coyote	Red Fox	Cottontail	Grey Squirrel	Red Squirrel	Chipmunk	Peromyscus	Turkey	Ruffed Grouse	Wh.-br. Nuthatch	Hunters/Dogs	Totals
04CA01	19-28 May 04	14	44°08'57.4"	73°01'05.3"																1				1
04CA03	4-12 Jun 04	14	44°08'57.5"	73°01'08.1"	1								1											2
04CA04	12-18 Jun 04	14	44°08'58.3"	73°01'04.2"	1																			1
04CA05	18–26 Jun 04	14	44°08'53.8"	73°01'07.0"	1																			1
04CA07	6-20 Jul 04	4	44°08'56.1"	73°01'02.1"					1															1
04CA08	20 Jul-11Aug04	20	44°09'08.6"	73°01'28.7"	1			5													1			7
04CA09	11-27 Aug 04	2	44°09'09.9"	73°01'28.9"	1										1									2
04CA13	22 Oct-11 Nov 04	21,14	44°09'11.2"	73°01'14.4"															1			1		2
05CA01	19-Jul-05	20	44°09'08.0"	73°01'28.8"				5																5
05CA04	28Sep-11Dec05	14/22	44°09'02.8"	73°01'07.7"			1		1															2
05CD02	5 Oct-2 Nov05	14	44°09'04.4"	73°01'12.1"		4	1							3							1		1	10
05CD03	2 Nov-14Dec 05	14	44°08'55.5"	73°01'07.8"																			1	1
06CA01	31-Jul-06	12	44°09'18.7"	73°01'13.5"			1						1							1				3
06CA02	8-Aug-06	12/21	44°09'20.2"	73°01'14.0"			2																1	3
06CA03	17-Aug-06	2/12	44°09'25.9"	73°01'15.9"			1																	1
06CD02	7-Aug-06	6	44°09'22.0"	73°01'32.0"	1				1															2
06CD05	8-Sep-06	6	44°09'23.9"	73°01'33.8"			2	1								1								4
06CD06	3-Oct-06	6	44°09'23.0"	73°01'41.5"									1											1
06CD07	13-Oct-06	1	44°09'09.8"	73°01'44.8"									2											2
07CA01	19 Jun-13 Jul	n/a	44°09'09.6"	-73°01'17.5"			1	1																2
07CA02	13Jul-20Aug	n/a	44°09'12.8"	-73°01'21.8"	1																			1
07CA03	20Aug-19 Sep	20	44°09'11.8"	-73°01'26.2"																				0
07CA04	19 Sep-22 Oct	20	44°09'11.1"	-73°01'28.1"																				0
07CD011	19-27Jun	6	44°09'22.1"	-73°01'30.0"			1																	1
07CD02	27 Jun-12 Jul	6	44°09'21.3"	-73°01'34.4"			2																	2
07CD03	12Jul-20Aug	1	44°09'16.0"	-73°01'41.3"			2																	2
07CD04	20 Aug-22 Oct	1	44°09'11.5"	-73°01'44.7"		6	1		1	1	1	3				2	4							19
11CA01	5-25 July	6	44°09'26.5"	-73°01'37.3"																				0
11CA02	25 Jul-9 Aug	20	44°09'10.3"	-73°01'25.7"	5		2																	7
11CA03	9 – 26 Aug	1	44°09'12.4"	-73°01'46.8"	1												3	2						6
11CA04	26 Aug-26 Sep	14	44°08'56.0"	-73°01'04.1"	1		13																	14
11CA05	26 Sep-10 Oct	6	44°09'21.9"	-73°01'36.3"																				0
11CA06	10 Oct-26 Oct	1	44°09'11.6"	-73°01'42.3"																				0
11CA07	26 Oct-11 Nov	20	44°09'10.2"	-73°01'28.2"																				0
11CD01	5-25 July	6	44°09'21.3"	-73°01'35.8"	1		3																	4
11CD02	25 Jul-9 Aug	20	44°09'06.9"	-73°01'29.9"	2		1																	3
11CD03	9 - 26 Aug	1	44°09'11.9"	-73°01'42.4"																				0
11CD04	26 Aug–26 Sep	14	44°08'54.7"	-73°01'06.5"																				0
11CD05	26 Sep-10 Oct	6	44°09'24.4"	-73°01'35.5"									1			1								2
11CD06	10 Oct-26 Oct	1	44°09'11.8"	-73°01'44.9"														5	1					6
11CD07	26 Oct-11Nov	20	44°09'10.8"	-73°01'26.1"			1																	1
				Total Images:	17	10	35	12	4	1	1	3	6	3	1	4	7	7	2	2	2	1	3	##

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