

Long-term Avian Research and Monitoring on Mt. Mansfield, Vermont

2013 Report to the Vermont Monitoring Cooperative



Part I. Demographic Monitoring of Montane Forest Birds on Mt. Mansfield

Part II. Forest Bird Surveys on Mt. Mansfield and Lye Brook Wilderness Area

Submitted by:

Christopher C. Rimmer, Steven D. Faccio and Kent P. McFarland

Vermont Center for Ecostudies

P.O. Box 420

Norwich, VT 05055

June 30, 2014

Part I. Demographic Monitoring of Montane Forest Birds on Mt. Mansfield

During 2013, we completed our 22nd consecutive field season of demographic monitoring of breeding montane forest birds on the Mt. Mansfield ridgeline. As in previous years, we focused our efforts on five target species: Bicknell's Thrush (*Catharus bicknelli*), Swainson's Thrush (*C. usutulatus*), Blackpoll Warbler (*Setophaga striata*), Yellow-rumped (Myrtle) Warbler (*S. coronata*), and White-throated Sparrow (*Zonotrichia albicollis*). However, as a means to more broadly assess population changes and the potential impacts of climatic warming, we expanded the scope of our work to encompass the entire avian community beginning in 2012. Additionally, we attached miniature geolocator tags to 19 Blackpoll Warblers to log location data for one full year. Retrieval of these will be attempted during the 2014 breeding season. This report presents a summary of data collected in 2013.

Methods

For the 22nd consecutive breeding season, we used mist-netting and banding to sample breeding bird species on an established study plot on the Mt. Mansfield ridgeline between c. 1155-1190 m (3800-3900 ft) elevation. We netted birds on 16 days between 6 June and 14 September 2013, using 10-30 nylon mist nets (12 x 2.5-m and 6 x 2.5-m, 36-mm mesh) placed at sites that have been used annually since 1992, primarily on the Amherst, Lakeview, and Long trails. Nets were generally opened from late afternoon until dusk and from dawn until late morning on the following day. Bicknell's Thrushes were captured both passively and through the use of vocal lures (recorded playbacks of conspecific vocalizations), while other species were passively captured. Each individual was fitted with a uniquely-numbered U.S. Fish and Wildlife Service (USFWS) leg band. We recorded data on age, sex, breeding condition, fat class, ectoparasites, flight feather wear, and net site of capture. Standard metrics included wing chord, tail length, weight, tarsal length, culmen length, bill length from mid-nares, bill width, and bill depth. We collected a single tail feather of Bicknell's Thrush for future chemical analysis such as stable isotopes or other trace elements.

We attached miniature geolocators to 19 Blackpoll Warblers, using a leg-loop backpack harness (Rappole and Tipton 1991) that has been deployed successfully on over 250 Bicknell's Thrushes, as well as on many other songbirds. During the 2013 breeding season, extensive efforts will be made to recapture these individuals. Once recaptured, geolocators will be removed and the data will be downloaded for analysis to determine migration, stop-over and wintering sites as well as phenology of the annual cycle.

Results and Discussion

We accumulated 1,290 net-hours in 2013, with a mean of 80.6 \pm 47.8 SD net-hours per day (range = 20.25–148.25). A total of 179 individuals of 15 species were captured and banded (Table 1.1), for a capture rate of 13.9 new birds/100 net-hours. We recaptured 32 individuals that had been banded in a previous year (Table 1.2). Among new captures, Yellow-rumped Warbler ranked first in abundance ($n = 28$; down from 48 in 2012), but

third in return captures ($n = 4$, 14% of total captured individuals), followed by White-throated Sparrows (Table 1.1). As usual, Bicknell's Thrush had the highest rate of return captures (34%), similar as previous years (e.g., 35.7% in 2011 and 29.6% in 2012). High site fidelity combined with intensive use of playback lures likely played a role in Bicknell's thrush recapture rates.

The ratio of male:female Bicknell's Thrush captures was 2.2:1 in 2013. Of the 38 Bicknell's Thrush captured, 15 were after second-year (ASY) males, 7 were second-year (SY) males, 6 were ASY females, 4 were SY females, 2 were ASY birds of unknown sex, 2 SY, and 2 were HY individuals of unknown sex. Our past research on the species' wintering grounds suggests that sexual habitat segregation may play a role in this. We are currently focused on conserving female dominated habitats on the wintering grounds.

Peer-reviewed journal papers recently published using VMC collected data

Rimmer, C.C. and K.P. McFarland. 2013. Bicknell's Thrush: a twenty-year retrospective on the Northeast's most vulnerable songbird. Bird Observer 41:9-16.

Townsend, J.T., C.T. Driscoll, C.C. Rimmer, and K.P. McFarland. 2014. Avian, salamander, and forest floor mercury concentrations increase with elevation in a terrestrial ecosystem. Environmental Toxicology and Chemistry 33:208-215.

Townsend, J.M., C.C. Rimmer, C.T. Driscoll, K.P. McFarland, and E.E. Iñigo-Elias. 2013. Mercury concentrations in tropical resident and migrant songbirds on Hispaniola. Ecotoxicology Volume 22 (1): 86-93. DOI 10.1007/s10646-012-1005-1.

Work Planned in 2014

- QA/QC banding database and submit for archival at VMC.
- Retrieve and analyze Blackpoll Warbler geolocators to determine locations and phenology during their annual cycle.
- Complete banding sessions for the 23rd year during the 2014 breeding season.

Acknowledgements

We are grateful to the Stowe Mountain Resort for allowing us access to the Mt. Mansfield toll road and for overnight use of the ski patrol building. We also thank Brendan Collins, Bill DeLuca, Randy Dettmers, Tim Duclos, Spencer Hardy, and John Lloyd for their skilled and dedicated fieldwork.

Table 1.1. Numbers of birds banded on Mt. Mansfield in 2012 and 2013, ranked by descending abundance.

Species	No. of New Individuals Captured		No. Recaps from Prior Years	Status
	2012	2013		
Yellow-rumped (Myrtle) Warbler	48	28	4	Breeding
White-throated Sparrow	37	26		Breeding
Bicknell's Thrush	27	25	19	Breeding
Blackpoll Warbler	37	24	6	Breeding
Dark-eyed (Slate-colored) Junco	19	18	1	Breeding
Swainson's Thrush	12	7	2	Breeding
Hermit Thrush	4	6		Transient
American Robin	3	5		Breeding
Golden-crowned Kinglet	1	4		Breeding
Yellow-bellied Flycatcher	2	3		Breeding
Black-throated Blue Warbler	1	1		Transient
Magnolia Warbler	8	1		Breeding
Ovenbird	1	1		Transient
Sharp-shinned Hawk	0	1		Breeding
Winter Wren	2	1		Breeding
Red-Breasted Nuthatch	2	0		Breeding
Ruby-crowned Kinglet	4	0		Breeding
Eastern Phoebe	1	0		Transient

Table 1.2. Capture histories for previously banded birds recaptured on Mt. Mansfield in 2012.

Species	bandnum	2013	2012	2011	2010	2009
BITH	157106564	2	1	2		2
BITH	193176911	3	2			
BITH	193176923	2	1			
BITH	193176934	1	5			
BITH	193176939	3	3			
BITH	193176941	2	1			
BITH	193176951	1	1			
BITH	234124023	1		2	3	
BITH	234124085	2	1	3		
BITH	234124095	2	5	3		
BITH	234124116	1	3	2		
BITH	234124128	1		1		
BITH	234124154	2	3	1		
BITH	234124169	2	4	1		
BLPW	211080379	3	1	2	1	1
BLPW	211080395	5	1	2	2	1
BLPW	222096662	1	1	2		
BLPW	249089362	1	1			
BLPW	249089920	1			1	
BLPW	249089933	1	1	2		
BLPW	249089936	1		2		
MYWA	249089377	3	1			
MYWA	249089381	2	3			
SCJU	249089323	1	1			
SWTH	157106297	1	4			
WTSP	144128854	1			1	1

BITH = Bicknell's Thrush; BLPW = Blackpoll Warbler, MYWA = Yellow-rumped (Myrtle) Warbler, SCJU= Dark-eyed Junco, SWTH = Swainson's Thrush, WTSP= White-throated Sparrow

Appendix. Bird banding data from Mt. Mansfield, 2013.

Species	bandnum	Date	Status	age	ha	sex	hs	Time	cp	bp	wg	wt
AMRO	115292859	14-Jun-13	1	1	1	5	16	840	0	3	125	
AMRO	115292860	17-Jun-13	1	1	1	4	15	1950	3	0	124.5	
AMRO	115292860	25-Jun-13	2	1	1	4	15	1230	3	0	124.5	74.2
AMRO	115292861	25-Jun-13	1	1	1	4	15	620	3	0	127	74.5
AMRO	115292862	10-Jul-13	1	1	1	4	15	850	3	0	136.5	73.5
AMRO	115292863	17-Jul-13	1	1	1	5	16	820	0	4	118	73
BITH	157106564	12-Jun-13	2	6	T9	5	6	2240	0	2		29.4
BITH	157106564	13-Jun-13	2	6	T9	5	6	2030	0	3		29.6
BITH	193176701	3-Jul-13	1	5	1T	5	6	830	0	4	89	28.4
BITH	193176702	3-Jul-13	1	5	1T	4	5	840	3	0	90.5	26.3
BITH	193176703	9-Jul-13	1	6	T	4	5	2100	3	0	92	
BITH	193176703	17-Jul-13	2	6	T	4	5	530	3	0	90	25.6
BITH	193176709	10-Jul-13	1	6	T	4	5	750	3	0	95	25.6
BITH	193176709	17-Jul-13	2	6	T	4	5	700	3	0	92	22.9
BITH	193176710	10-Jul-13	1	5	1T	4	5	810	2	0	89.5	29.5
BITH	193176711	10-Jul-13	1	5	1T	4	5	800	2	0	91	
BITH	193176714	10-Jul-13	1	5	1T	5	6	920	0	4	87.5	28.1
BITH	193176715	16-Jul-13	1	6	T	4	5	2020	2	0	95	26.4
BITH	193176716	16-Jul-13	1	4	1	0		2130				27.5
BITH	193176718	16-Jul-13	1	6	T	4	5	2210	1	0	92.5	25.9
BITH	193176720	17-Jul-13	1	4	1	0		640			78	21.5
BITH	193176723	14-Sep-13	1	1	2T	0		930	0	0	92	28.8
BITH	193176724	14-Sep-13	1	2	BT	0		1000	0	0	93.5	29.8
BITH	193176725	14-Sep-13	1	2	1B	0		1030	0	0	86	25.3
BITH	193176726	14-Sep-13	1	1	12	0		1210	0	0	87	25.6
BITH	193176911	5-Jun-13	2	6	9T	5	9	750	0	0	87	26.1

BITH	193176911	14-Jun-13	2	6	1T	5	6	930	0	3	87	29.6
BITH	193176911	17-Jun-13	2	6	T9	5	6	2100	0	3	87.5	29.2
BITH	193176923	9-Jul-13	2	6	T9	4	5	2220	2	0	90	26.9
BITH	193176923	17-Jul-13	2	6	9	4	5	530	2	0	90	24.6
BITH	193176934	17-Jul-13	2	6	9T	5	6	700	0	4	91.5	
BITH	193176939	4-Jun-13	2	6	T9	4	5	2030	2	0	91.5	27
BITH	193176939	5-Jun-13	2					550				25.9
BITH	193176939	25-Jun-13	2	6	9T	4	5	1130	3	0	93	27.7
BITH	193176941	4-Jun-13	2	6	9T	4	5	2050	2	0	92.5	29.8
BITH	193176941	13-Jun-13	2	6	T9	4	5	1950	3	0	92	30.5
BITH	193176951	18-Jun-13	2	6	T9	4	5	810	3	0	91	26.7
BITH	193176964	4-Jun-13	1	6	T	5	9	2020	0	0	87	26.6
BITH	193176964	9-Jul-13	2	6	T	5	6	1950	0	3	90	23.1
BITH	193176967	4-Jun-13	1	5	T	5	9	2100	0	0	88	27.3
BITH	193176967	18-Jun-13	2	5	T5	5	6	510	0	4		26.5
BITH	193176967	2-Jul-13	2	5	T	5	6	2040	0	3	86.5	28.2
BITH	193176972	5-Jun-13	1	6	T	5	9	750	1	0	89	27.4
BITH	193176972	13-Jun-13	2	6	T	5	6	520	0	2	89.5	35.6
BITH	193176972	9-Jul-13	2	6	T	5	6	1950	0	4	87.5	27.7
BITH	193176978	12-Jun-13	1	5	1	4	5		2		91	28.5
BITH	193176978	18-Jun-13	2	5	1T	4	5	740	3	0	90	26.7
BITH	193176978	24-Jun-13	2	5	B1	4	5	2000	3	0	89.5	28.9
BITH	193176978	25-Jun-13	2	5	T	4	5	700	3	0		27.6
BITH	193176978	2-Jul-13	2	5	1	4	5	1940	3	0	90.5	27.7
BITH	193176978	14-Sep-13	2	5	9	4	9	1130	0	0	92.5	28.1
BITH	193176983	14-Jun-13	1	5	1T	5	6	620	0	2	86	33.4
BITH	193176983	16-Jul-13	2	5	1T	5	6	2010	0	4	85.5	26.4
BITH	193176989	18-Jun-13	1	5	TB	4	5	920	3	0	88	26.8

BITH	193176991	24-Jun-13	1	6	T	4	5	2200	3	0	89.5	26.4
BITH	193176991	2-Jul-13	2	6	T	4	5	2130	3	0	89.5	27.1
BITH	193176993	25-Jun-13	1	5	T	4	5	700	3	0	91.5	28
BITH	193176996	25-Jun-13	1	5	T1	4	5	820	3	0	86	25.9
BITH	234124023	25-Jun-13	2	6	9T	4	5	930	3	0	95	27.5
BITH	234124085	13-Jun-13	2	6	T9	4	5	2030	3	0	93	31.2
BITH	234124085	3-Jul-13	2	6	T9	4	5	740	3	0	93.5	29.1
BITH	234124095	12-Jun-13	2	6	T9	4	5	1900	3	0	92.5	29.7
BITH	234124095	18-Jun-13	2	6	T9	4	5	1220	3	0	94	28.9
BITH	234124116	25-Jun-13	2	6	1	4	15	600	3		89.5	26.8
BITH	234124128	18-Jun-13	2	6	9T	5	6	600	0	3		
BITH	234124154	4-Jun-13	2	6	1T	4	5	2040	3	0	90.5	30.3
BITH	234124154	13-Jun-13	2	6	9	4	5	940	3	0	91.5	30.2
BITH	234124169	13-Jun-13	2	6	T9	4	5	630	3	0	93.5	26.9
BITH	234124169	3-Jul-13	1	6	9T	4	5	840	3	0	93	26.3
BLPW	211080026	17-Jul-13	1	4	1	0		550	0	0	69	11.6
BLPW	211080379	18-Jun-13	2	6	19	4	15	600	3	0		12.1
BLPW	211080379	24-Jun-13	2	6	19	4	1	2000			72.5	
BLPW	211080379	16-Jul-13	2	6	1	4	15	2230				
BLPW	211080395	5-Jun-13	2	6	19	4	15	550	2	0		11.2
BLPW	211080395	13-Jun-13	2	6	19	4	15	650	3	0	73	11.3
BLPW	211080395	25-Jun-13	2	6	19	4	51	530	3	0	76	
BLPW	211080395	3-Jul-13	2	6	19	4	1	950	2	0	75	
BLPW	211080395	9-Jul-13	2	6	19	5	41	1950	2	0	76	
BLPW	222096662	3-Jul-13	2	6	19	4	15	1100	3	0	75	11.8
BLPW	245059051	3-Jul-13	1	1	1	4	15	600	3	0	69.5	10.4
BLPW	249089362	25-Jun-13	2	6	19	4	15	840	3	0	72.5	11.9
BLPW	249089920	10-Jul-13	2	6	19	4	15	1100	2	0	74	11.3

BLPW	249089933	18-Jun-13	2	6	19	4	15	920	3	0	73.5	12.3
BLPW	249089936	13-Jun-13	2	6	19	4	15	910	2	0	72.5	11.1
BLPW	254059013	4-Jun-13	1	1	1	5	1	1930	0	0	72.5	12.1
BLPW	254059015	4-Jun-13	1	1	1	4	15	2130	3	0	73	13.1
BLPW	254059016	5-Jun-13	1	1	1	4	15	510	3	0	75.5	11.7
BLPW	254059016	13-Jun-13	2	5	1T	4	15	830	3	0	76	11.6
BLPW	254059017	5-Jun-13	1	1	1	4	15	550	2	0	75	11.5
BLPW	254059017	13-Jun-13	2	1	1	4	15	720	3	0	72.5	12.1
BLPW	254059022	5-Jun-13	1	1	1	5	1	1140	0	0	73	14.5
BLPW	254059025	13-Jun-13	1	5	1T	4	15	540	2	0	71	11.5
BLPW	254059026	13-Jun-13	1	5	1	4	15	620	3	0	71	11.2
BLPW	254059026	18-Jun-13	2	5	1	4	15	600	3	0		11.2
BLPW	254059026	25-Jun-13	2	5	1	4	15	600	3	0	72.5	
BLPW	254059030	13-Jun-13	1	5	1	4	15	1830	3	0	72	12.5
BLPW	254059035	17-Jun-13	1	5	1	4	15	2110	3	0	70.5	12.2
BLPW	254059036	18-Jun-13	1	1	1	4	15	640	3	0	74.5	
BLPW	254059036	17-Jul-13	2	6	1	4	51	800	3	0	73.5	13
BLPW	254059038	18-Jun-13	1	1	1	4	15	810	3	0	75	12.5
BLPW	254059039	18-Jun-13	1	1	1	5	16	940	0	2	68	12
BLPW	254059039	16-Jul-13	2	1	1	5	61	1910	0	4	67	11.4
BLPW	254059040	18-Jun-13	1	5	1	4	51	950	3	0	67	11.1
BLPW	254059043	24-Jun-13	1	5	1	4	51	2020	3	0	70	
BLPW	254059043	9-Jul-13	2	5	1	4	15	1940	2	0	70	
BLPW	254059043	16-Jul-13	2	5	1	4	15	2020	2	0	70	12.6
BLPW	254059044	25-Jun-13	1	6	1	4	15	700	3	0	63.5	11.6
BLPW	254059047	25-Jun-13	1	5	1	4	15	1150	3	0	70	12.1
BLPW	254059058	9-Jul-13	1	5	1	4	51	2230	3	0	72	1.4
BLPW	254059065	16-Jul-13	1	5	1	4	15	2230	2	0	73.5	12.4

BLPW	254059073	17-Jul-13	1	6	1	4	51	800	2	0	71.5	11.5
BLPW	254059075	17-Jul-13	1	1	1	5	16	830	0	5	69	11.7
BLPW	254059076	17-Jul-13	1	4	1	0		840			71.5	14
BLPW	254059083	14-Sep-13	1	1	2	0		1030	0	0	77	12.4
BTBW	254059074	17-Jul-13	1	2	1	5	1	820	0	0	59	9.4
GCKI	211080028	17-Jul-13	1	2	1	0		700	0	0	55	
GCKI	211080029	17-Jul-13	1	2	1	0		810	0	0	55.5	25.9
GCKI	211080030	14-Sep-13	1	2	1	4	1	900	0	0	54.5	6.2
GCKI	211080031	14-Sep-13	1			4	1	1130			57	6.2
HETH	193176705	9-Jul-13	1	2	1	0		2320	0	0	84	27.3
HETH	193176706	9-Jul-13	1	2	1	0		2320	0	0	92.5	29.6
HETH	193176707	10-Jul-13	1	2	1	0		640			87.5	26.5
HETH	193176713	10-Jul-13	1	2	1	0		800	0	0	89.5	27.1
HETH	193176719	16-Jul-13	1	2	1	0	2	2230			85	26.1
HETH	234176981	13-Jun-13	1	5	1T	5	6	2110	0	4	88	32.4
HETH		16-Jul-13	1	2	1	0		2050	0	0	87	27.5
MAWA	254059045	25-Jun-13	1	5	1T	4	15	830	2	0	57.5	8.1
MYWA	234059019	13-Jun-13	2	1	1	5	16	630	0	3	69	12.6
MYWA	249089377	4-Jun-13	2	6	19	4	15	1830	3	0	73.5	12.4
MYWA	249089377	14-Jun-13	2	6	1T	4	15	930	3	0	73	11.1
MYWA	249089377	9-Jul-13	2	6	19	4	15	1920	3	0	73.5	12.4
MYWA	249089381	4-Jun-13	2	6	1T	4	15	1900	3	0	74	12.4
MYWA	249089381	5-Jun-13	2	5	15	4	15	1000	3	0	72	12
MYWA	254059001	25-Jun-13	2	5	1T	4	51	830	3	0	70.5	11.1
MYWA	254059010	4-Jun-13	1	6	1T	4	15	1830	3	0	75	12.3
MYWA	254059011	4-Jun-13	1	5	1T	4	15	1840	3	0	68.5	11.7
MYWA	254059012	4-Jun-13	1	5	1T	4	15	1840	3	0	71.5	12.6
MYWA	254059012	13-Jun-13	2	5	1	4	15	720	3	0	71	12

MYWA	254059014	4-Jun-13	1	6	1T	4	15	1940	3	0	71.5	12.1
MYWA	254059014	14-Jun-13	2	6	1T	4	15	920	3	0	70.5	11.1
MYWA	254059014	18-Jun-13	2	6	1T	4	15	720	2	0	71.5	11.1
MYWA	254059019	5-Jun-13	1	5	1	5	16	640	0	2	70	14.1
MYWA	254059020	5-Jun-13	1	5	1	5	1	800	0	0	65.5	12.5
MYWA	254059020	25-Jun-13	2	5	1	5	16	1030	0	3		
MYWA	254059021	5-Jun-13	1	6	1	4	15	1010	2	0	73	11.6
MYWA	254059021	12-Jun-13	2	6	1	4	15	1850	3	0	72	12.5
MYWA	254059023	12-Jun-13	1	1	1	4	15	1910	2	0	70.5	13.2
MYWA	254059032	14-Jun-13	1	1	1	5	16	910	0	3	67	11.6
MYWA	254059033	14-Jun-13	1	6	1T	4	15	940	3	0	73	12.1
MYWA	254059037	18-Jun-13	1	1	1	5	16	720	0	3	67.5	11
MYWA	254059041	18-Jun-13	1	5	1	4	15	1100	2	0	71	11.6
MYWA	254059041	25-Jun-13	2	5	1	4	15	530	3	0	70.5	
MYWA	254059046	25-Jun-13	1	5	1T	5	16	1110	0	4	68	12.9
MYWA	254059049	2-Jul-13	1	6	1	4	15	1930	3	0	73.5	12.3
MYWA	254059050	2-Jul-13	1	1	1	4	15	1930	3	0	73	13
MYWA	254059052	3-Jul-13	1	5	1	5	61	630	0	4	69	12.4
MYWA	254059054	9-Jul-13	1	5	1	5	16	1920	0	4	68	13.3
MYWA	254059055	9-Jul-13	1	6	1	5	16	2100	0	4	70	12.3
MYWA	254059056	9-Jul-13	1	1	1	4	15	2110	2	0	68	12.4
MYWA	254059057	9-Jul-13	1	6	T1	4	15	2110	2	0		
MYWA	254059059	9-Jul-13	1	5	1	4	15	2320	2	0	69	
MYWA	254059061	10-Jul-13	1	5	1T	4	15	850	3	0	69	12.5
MYWA	254059062	10-Jul-13	1	5	1	4	15	1100	3	0	70	11.7
MYWA	254059063	16-Jul-13	1	6	1T	5	16	1920	0	4	65.5	12.2
MYWA	254059066	17-Jul-13	1	5	1	4	15	550	2	0	72	12.1
MYWA	254059067	17-Jul-13	1	2	1	0		700	0	0	72	10.9

MYWA	254059068	17-Jul-13	1	2	1	0		700	0	0	68	10.9
MYWA	254059084	14-Sep-13	1	2	1	0		1120			70	11.3
OVEN	208143316	17-Jul-13	1	2	1	0		840			69	18
SCJU	249089323	12-Jun-13	2	6	9	4	15	2110	2	0	72.5	20.5
SCJU	254059018	5-Jun-13	1	1	13	4	15	610	3	0	76	18.7
SCJU	254059024	12-Jun-13	1	1	13	4	15	2240	3	0	78	18.9
SCJU	254059024	17-Jun-13	2	1	13	4	15	2100	3	0		19
SCJU	254059024	25-Jun-13	2	1	13	4	15	1010	3	0	77	18.8
SCJU	254059027	13-Jun-13	1	1	1	5	16	620	0	3	73	18.9
SCJU	254059029	13-Jun-13	1	1	13	4	15	950	3	0	75.5	18.7
SCJU	254059034	17-Jun-13	1	1	13	4	15	2100	3	0	76.5	20.2
SCJU	254059042	18-Jun-13	1	1		4	5	1120	2	0	83	19.2
SCJU	254059060	10-Jul-13	1	1	13	5	61	840	0	4	73	18.5
SCJU	254059064	16-Jul-13	1	2	13	0		2210	0	0	79.5	19.9
SCJU	254059069	17-Jul-13	1	2	13	0		700			71	16.8
SCJU	254059070	17-Jul-13	1	2	13	0		700			72	16.2
SCJU	254059071	17-Jul-13	1	2	13	0		730			73	17.9
SCJU	254059072	17-Jul-13	1	2	13	0		750			76.5	17.7
SCJU	254059077	17-Jul-13	1	2	13	0		850			71	16.6
SCJU	254059078	17-Jul-13	1	2	13	0		900			74	17.6
SCJU	254059079	17-Jul-13	1	2	13	0		1010			73.5	17.2
SCJU	254059080	17-Jul-13	1	2	10	0		1040	0	0	70.5	17.7
SCJU	254059081	17-Jul-13	1	2	13	0		1040			75	18.7
SCJU	254059082	17-Jul-13	1	2	1	0		1050	0	0	75.5	18.5
SSHA	115292858	13-Jun-13	1	5	13	4	1	830	0	0	158	>100
SWTH	157106297	13-Jun-13	2	6	9	4	5	640	3	0	96	29.1
SWTH	193176708	10-Jul-13	1	5	1	4	5	710	2	0	100	29.8
SWTH	193176717	16-Jul-13	1	6	T	4	45	2050	2	0	100	27.6

SWTH	193176722	17-Jul-13	1	6	T	5	6	930	0	4	95	28.2
SWTH	193176979	13-Jun-13	1	1	1	4	5	850	3	0	96	27.7
SWTH	193176992	25-Jun-13	1	6	T	4	5	700	3	0	96	29.2
SWTH	193176997	25-Jun-13	1	5	1T	4	5	830	3	0	92	30.7
SWTH	193176998	25-Jun-13	1	5	1T	4	5	910	2	0	97	29
WIWR	254059031	14-Jun-13	1	1	1	4	5	850	3	0		
WIWR	254059031	18-Jun-13	2	1	1	4	5	940	2	0	46	
WTSP	144128854	10-Jul-13	2	6	9	4	5	800	3	0	71	
WTSP	193176704	9-Jul-13	1	1	13	4	5	2300	3	0	73	
WTSP	193176712	10-Jul-13	1	1	13	5	6	800	0	3	68	26
WTSP	193176712	17-Jul-13	2	1	13	5		700	0	4	71	23
WTSP	193176721	17-Jul-13	1	2	13	0		930			72	25.4
WTSP	193176965	4-Jun-13	1	1	13	4	15	1940	3	0	73	27.5
WTSP	193176965	13-Jun-13	2	1	13	4	5	1120	3	0	72	26.9
WTSP	193176965	13-Jun-13	2	1	13	4	5	2040	3	0	72	27.7
WTSP	193176965	25-Jun-13	2	1	13	4	5	1030	3	0	73	24.4
WTSP	193176966	4-Jun-13	1	1	13	0		2040	0	0	74	26
WTSP	193176968	5-Jun-13	1	1		0		550	0	0	67	24.1
WTSP	193176968	3-Jul-13	2	1	13	5	6	1130	0	3	73	
WTSP	193176969	5-Jun-13	1	1	13	4	5	600	3	0	75	24.7
WTSP	193176969	13-Jun-13	2	1	1	4	5	540	3	0	76.5	25
WTSP	193176969	18-Jun-13	2	1	13	4	5	750	3	0	76	24.9
WTSP	193176969	3-Jul-13	2	1	13	4	5	540	3	0	76	23.2
WTSP	193176969	16-Jul-13	2	1	13	4	5	2140	3	0	76	24.6
WTSP	193176970	5-Jun-13	1	1	13	4	5	640	3	0	73	23.5
WTSP	193176970	13-Jun-13	2	1	1	4	5	540	3	0	72	
WTSP	193176970	3-Jul-13	2	1	1	4	5	720	3	0	75.5	22.7
WTSP	193176971	5-Jun-13	1	1	13	4	5	650	3	0	71.5	25.4

WTSP	193176971	13-Jun-13	2	1	13	4	5	820	3	0	71.5	25.4
WTSP	193176973	5-Jun-13	1	1	1	4	5	750	3	0	70	24.5
WTSP	193176973	14-Jun-13	2	1	13	4	5	620	3	0	71.5	25.2
WTSP	193176973	25-Jun-13	2	1	1	4	5	700	3	0	74	26
WTSP	193176973	17-Jul-13	2	1	13	4	5	620	3	0	72	24.1
WTSP	193176974	5-Jun-13	1	1	13	4	5	800	2	0	71	22.7
WTSP	193176975	5-Jun-13	1	1	13	4	5	910	2	0	71.5	24.5
WTSP	193176975	25-Jun-13	2	1	13	4	5	1120	3	0	74	
WTSP	193176976	12-Jun-13	1	1	13	5	6	1850	0	3	66.5	25.5
WTSP	193176976	18-Jun-13	2	1	13	5	6	700	0	3		
WTSP	193176976	25-Jun-13	2	1	1	5	6	1140	0	3	69	23.4
WTSP	193176976	2-Jul-13	2	1	1	5	6	1930	0	3	69	22.8
WTSP	193176977	12-Jun-13	1	1	13	4	5	2110	3	0	74	25.7
WTSP	193176977	13-Jun-13	2	1	13	4	5	510	3	0		24.9
WTSP	193176977	25-Jun-13	2	1	1	4	5	610	3	0	74	24.6
WTSP	193176980	13-Jun-13	1	1	13	4	5	950	3	0	74	26.4
WTSP	193176980	14-Jun-13	2	1	13	4	5	840	3	0	73.5	25.6
WTSP	193176984	17-Jun-13	1	1	13	5	6	1940	0	3	69	27
WTSP	193176985	17-Jun-13	1	1	13	4	5	2120	2	0	71	25.1
WTSP	193176985	25-Jun-13	2	1	13	4	5	1020	3	0		
WTSP	193176986	18-Jun-13	1	1	13	5	6	620	0	3	67	24.3
WTSP	193176986	2-Jul-13	2	1	1	5	9	1930	0	0	66.5	26.4
WTSP	193176987	18-Jun-13	1	1	13	4	5	620	3	0	73	
WTSP	193176988	18-Jun-13	1	1	13	4	5	640	2	0	70.5	23.4
WTSP	193176990	18-Jun-13	1	1	13	4	5	950	2	0	74	25.7
WTSP	193176994	25-Jun-13	1	1	13	5	6	800	0	4	69	23.3
WTSP	193176995	25-Jun-13	1	1	13	0		800	0	0	70	
WTSP	193176999	25-Jun-13	1	1	13	5	6	1120	0	3	71	24.7

WTSP	193177000	2-Jul-13	1	1	13	4	5	2110	3	0	72	26.8
WTSP	234176982	14-Jun-13	1	1	13	4	5	620	3	0	76	24.7
WTSP		17-Jul-13	1	1	13	4	5	630	3	0		
YBFL	254059028	13-Jun-13	1	1	1	0		800	0	0	67	11.3
YBFL	254059048	25-Jun-13	1	1	1	4	5	1150	2	0	70	
YBFL	254059053	3-Jul-13	1	1	1	5	6	930	0	4	68	11

Part II. Forest Bird Surveys on Mt. Mansfield and Lye Brook Wilderness Area

In 2013, breeding bird surveys were continued at 2 permanent study sites on Mt. Mansfield. The Mt. Mansfield ridgeline was surveyed for the 23rd consecutive year while the Ranch Brook site was censused for the 18th year in 2013 (the 2004 survey was not completed due to inclement weather on attempted survey dates). Our permanent study site at Underhill State Park was surveyed for the 20th year in 2013 (the site was not surveyed in 2003, 2005, or 2012), while the Lye Brook Wilderness Area site was surveyed for the 13th year (the 2012 survey was not completed due to inclement weather on attempted survey dates).

The Mt. Mansfield ridgeline site, at 1158 m (3800 ft), consists of montane fir-spruce, while the Ranch Brook site ranges between 975 and 1097 m (3200 and 3600 ft), and is dominated by a paper birch-fir canopy. Underhill State Park site consists of mature northern hardwoods ranging from 609 to 731 m (2000 to 2400 ft) elevation. The Lye Brook study site, located in Winhall, VT just north of Little Mud Pond, is characterized by mature northern hardwoods at an elevation of 701 m (2300 ft).

These four study sites are part of VCE's long-term Forest Bird Monitoring Program (FBMP). This program was initiated in 1989 with the primary goals of conducting habitat-specific monitoring of forest interior breeding bird populations in Vermont and tracking long-term changes (Faccio et al. 1998). As of 2008, VCE had established 32 monitoring sites in 9 different forested habitats primarily in Vermont, but with two sites just across the Connecticut River in New Hampshire. A complementary, volunteer-based, long-term monitoring program, called Mountain Birdwatch, was initiated in 2000 to collect census data on montane forest bird species throughout the Northeast (Scarlet 2011). Also, through a cooperative agreement with the National Park Service, VCE coordinates breeding bird monitoring at 11 National Parks and Historic Sites in the Northeast. Initiated in 2006, National Park surveys are conducted at 29 study sites in New Jersey, Connecticut, New York, Massachusetts, Vermont, New Hampshire, and Maine (Faccio and Mitchell 2014).

Methods

In 2013, surveys at the Mt. Mansfield Ridgeline and Ranch Brook were conducted by a VCE seasonal biologist, and by volunteer observers at Underhill State Park and Lye Brook. Each study site consisted of 5 point count stations. Survey methods consisted of unlimited distance point counts, based on the approach described by Blondel et al. (1981) and used in Ontario (Welsh 1995). The count procedure was as follows:

- 1) Counts began shortly after dawn on days where weather conditions were unlikely to reduce count numbers (i.e., calm winds and very light or no rain). Censusing began shortly (< 1 min) after arriving at a station.
- 2) Observers recorded all birds seen and heard during a 10-min sampling period, which was divided into 3 time intervals: 3, 2, and 5 mins. Observers noted in which time interval each bird was first encountered, and placed birds into one of 2 distance categories (within or beyond 50 m). To reduce duplicate records, individual birds were mapped on standardized field cards, and known or presumed movements were noted. Different symbols were used to record the status of birds encountered (i.e., singing male, pair observed, calling bird, etc.).
- 3) The number of surveys at each site was dependent on elevation; montane fir-spruce sites were sampled once, while LBWA and Underhill were sampled twice during the breeding season, the first during early June (ca. 2-12 June) and the second during late June (ca. 14-30 June). Observers were

encouraged to space their visits 7-10 days apart. For each site visit, all stations were censused in a single morning and in the same sequence.

In summarizing data for analysis, the maximum count for each species was used as the station estimate for each year. All birds seen or heard were each counted as 1 individual unless a family group or active nest was encountered, in which case they were scored as a breeding pair, or 2 individuals. Population trends were calculated for the 8 most commonly encountered species at each site using simple linear regression. For each species, the annual population trend was calculated by plotting the maximum count against year, and then calculating the mean annual rate of change of a linear trendline inserted through the points (e.g. Percent Annual Trend = slope ÷ y intercept x 100). Regression and correlation analyses were done using SYSTAT 10.2.

Results and Discussion

All four study sites experienced low counts of relative abundance, species richness, or both in 2013. For the second time in four years, both montane study sites on Mount Mansfield documented record or near record lows for relative abundance and species richness. Although the number of individual birds detected at Underhill State Park in 2013 was slightly below average, species richness was among the lowest ever recorded. In contrast, the number of individual birds detected at Lye Brook was the second lowest in the counts history, while species richness was average.

Overall, a combined total of 55 avian species have been detected during breeding bird surveys at three study sites on Mt. Mansfield from 1991-2013. Species richness was similar at both montane forest sites, with a total of 31 species detected at both the Mansfield ridgeline and Ranch Brook. Surveys at Ranch Brook continue to average a greater number of individuals and species per year than the higher elevation and more exposed Mansfield ridgeline site (Tables 2.1 and 2.2). Surveys at the mid-elevation, northern hardwood study sites at Underhill State Park and Lye Brook Wilderness showed similar species composition, with a total of 46 species detected at both study sites (Tables 2.3 and 2.4).

Mount Mansfield

On the Mt. Mansfield ridgeline plot in 2013, the number of species detected (n=8) was the lowest ever recorded in the count's 23 year history, while numerical abundance (n=46) was the second lowest following 2011's tally of just 36 individual birds (Table 2.1). Of the eight most commonly recorded species, only Winter Wren was above the 23-year average, and counts of just two species (Winter Wren and Bicknell's Thrush) increased from 2012. For the first time in the survey no American Robins were detected. Not surprisingly, six of the eight most common species exhibited decreasing population trends, although only two of those were statistically significant (Blackpoll Warbler and Bicknell's Thrush). Despite Blackpoll Warbler counts near the 23-year mean, the species continued to exhibit a significant decline of 2.42% per year ($r^2 = 0.270$; $P \leq 0.011$). Although counts of Bicknell's Thrush were the highest since 2009, the species showed a weakly declining trend for the second consecutive year of 1.25% per year ($r^2 = 0.131$; $P = 0.090$).

At the Ranch Brook study site in 2013, numerical abundance (n=36) was the lowest recorded in the site's 18-year history, while species richness equaled 2011's record low of 11 species (Table 2.2). Although no new species were detected, a single Blue-headed Vireo was recorded, just the second for the survey, and a single Hermit Thrush was found for the second year in a row and the fourth for the site. As with the Mansfield ridgeline plot, of the eight most abundant species, only Winter Wren was above the long-term mean for Ranch Brook, while counts for seven species were below the 18-year mean, including no

detections of both Bicknell's Thrush and Dark-eyed Junco, the first time these species were not detected on the survey. Overall, just two of these eight species showed increasing trends, while six declined, three of which were statistically significant (Yellow-bellied Flycatcher, Blackpoll Warbler, and White-throated Sparrow). Numbers of White-throated Sparrow dropped sharply from 10 in 2012 (the highest count since 2003) to just two birds in 2013, a new record low for the site, continuing a downward trend at a rate of 3.59% per year ($r^2 = 0.404$; $P \leq 0.005$). Blackpoll Warbler numbers remained slightly below average, continuing an annual decline of 2.84% ($r^2 = 0.274$; $P = 0.026$), as did Yellow-bellied Flycatcher, which declined at a rate of 2.60% per year ($r^2 = 0.395$; $P = 0.005$).

At Underhill State Park in 2013, total number of individuals and species richness remained well below average for the site, with just 52 individuals of 14 species recorded (Table 2.3). Among the 8 most common species, three were above the 20-year mean, and five were below. As with the Mt. Mansfield montane sites, Winter Wrens were abundant at Underhill State Park in 2013, equaling the record high counts of six from 1992 and 1998. Once aging, five of the eight most common species showed increasing population trends, including significant increases for Black-throated Blue Warbler (4.89%; $r^2 = 0.278$, $P = 0.016$) and Black-throated Green Warbler (4.47%; $r^2 = 0.402$, $P = 0.002$). Once common at Underhill State Park in low numbers, Canada Warbler has only been detected twice in the last eight years (including one bird in 2013), continuing its downward trend at 4.86% per year ($r^2 = 0.689$, $P < 0.0009$).

Lye Brook Wilderness

At Lye Brook Wilderness, numerical abundance ($n=49$) dropped to the second lowest in the site's history, while species richness ($n=16$) equaled the 13-year mean, including three new species for the survey (Broad-winged Hawk, Nashville Warbler, and Black-and-White Warbler) (Table 2.4). Among the eight most common species, six were below the 13-year average. Of these eight species, three exhibited increasing population trends, one of which was statistically significant (Red-eyed Vireo), while five declined (two significantly; Black-throated Blue Warbler and Ovenbird). Although Ovenbird numbers increased to just below the 13-year mean, the species continued a declining trend at an annual rate of 2.67% ($r^2 = 0.371$; $P = 0.027$), while numbers of Black-throated Blue Warbler dropped to a record low of just three individuals, resulting in a significant decline of 3.31% per year ($r^2 = 0.355$; $P = 0.032$). Although Red-eyed Vireo numbers dropped from the previous survey in 2011, their relative abundance remained above the 13-year mean and continued an increasing trend at 10.19% per year ($r^2 = 0.295$; $P = 0.055$).

The site-specific trend estimates presented for the Mt. Mansfield and Lye Brook sites must be interpreted carefully as these data are from a limited geographic sample with low power. Year to year changes in survey counts may simply reflect natural fluctuations in abundance, differences in detection rates, variability of singing rates due to nesting stage, and/or a variety of dynamic factors, such as prey abundance, overwinter survival, and local habitat change. It should be noted that two new observers participated in the 2013 surveys; one of which surveyed both montane study sites on Mt. Mansfield, while the second surveyed Underhill State Park. While both observers had excellent bird identification skills, we did not account for potential differences in detection probabilities among observers, which can vary due to experience, age and hearing ability (Alldredge et al. 2007). Continued data collection and comparison with survey data from other ecologically similar sites will be necessary to elucidate meaningful population trends of various species at these sites.

Acknowledgements

Many thanks to Bobbie Jean Booth and Jason Crooks for conducting bird surveys at the Lye Brook Wilderness Area and Underhill State Park, respectively.

Literature Cited

- Allredge, M. W., T. R. Simons, and K. H. Pollock. 2007. Factors affecting aural detections of songbirds. *Ecological Applications* 17: 948-955
- Blondel, J., C. Ferry, and B. Frochot. 1981. Point counts with unlimited distance. Pp. 414-420, *In* C. John Ralph and J. Michael Scott (Eds.). Estimating numbers of terrestrial birds. *Studies in Avian Biology* 6: 630pp.
- Faccio, S.D. and B.R. Mitchell. 2014. Breeding landbird monitoring in the Northeast Temperate Network: 2013 Summary Report. Natural Resource Data Series NPS/NETN/NRDS—2014/630. National Park Service, Fort Collins, CO.
- Faccio, S.D., C.C. Rimmer, and K.P. McFarland. 1998. Results of the Vermont Forest Bird Monitoring Program, 1989-1996. *Northeastern Naturalist* 5(4): 293-312.
- Scarl, J.C. 2011. Mountain Birdwatch 2010-11: Annual report to the United States Fish and Wildlife Service. Unpublished Report, Vermont Center for Ecostudies, Norwich, VT.
- Welsh, D.A. 1995. An overview of the Forest Bird Monitoring Program in Ontario, Canada. Pp. 93-97, *In* C.J. Ralph, J.R. Sauer, and S. Droege, (Eds.). Monitoring bird populations by point counts. General Technical Report PSW-GTR-149. Pacific Southwest Research Station, Forest Service, U.S. Dept. of Agriculture, Albany, CA. 181pp.

Table 2.1. Maximum counts of individual birds, and population trends from linear regression analysis for the 8 most common species (bold type) at Mt. Mansfield Ridgeline, 1991-2013.

Common Name	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)	
Red Squirrel											1													0.04	0.21			
Sharp-shinned Hawk										1														0.04	0.21			
Hairy Woodpecker				1																				0.04	0.21			
Northern Flicker			1																					0.04	0.21			
Yellow-bellied Flycatcher			1		1	2	3		1	1	1	1	2	1		1	2	1	3				3	3	1.17	1.07		
Alder Flycatcher							1																	0.04	0.21			
Red-eyed Vireo										1														0.04	0.21			
Blue Jay		1												1		1								0.13	0.34			
Common Raven			1			1			1	1		1	1	1		2		1					3	0.57	0.79			
Red-breasted Nuthatch	1	2	3	1	3	1		1	2		1					1		1					2	0.83	0.98			
Winter Wren	10	9	7	4	5	2	4	10	8	4	4	7	3	7	8	12	7	5	6	8	4	5	10	6.48	2.63	0.002	0.28	
Golden-crowned Kinglet										1														0.04	0.21			
Ruby-crowned Kinglet		2			1							1	1							1		1		0.30	0.56			
Veery																							1	0.05	0.21			
Bicknell's Thrush	6	15	11	8	10	11	9	9	8	7	9	9	6	5	8	11	12	7	10	6	7	6	8	8.61	2.37	0.131	-1.25*	
Swainson's Thrush	3	8	1	1	3	6	7	5	4	3	3	2	2	1	2	5	1	5	3	5	1	6	2	3.43	2.09	0.022	-1.14	
Hermit Thrush											1		1										1	0.13	0.34			
American Robin	1	4	1	2	2	2	2	1	1	3	3	2	6	3	1	3	4	3	2	4	3	6		2.57	1.53	0.094	3.99	
Cedar Waxwing		1	4				9							1										0.65	2.01			
Nashville Warbler	2					2	3	1	1		1					1						1		0.57	0.84			
Magnolia Warbler	1	2				3	1	1			1		3	1	4		1					1	2	0.91	1.16			
Yellow-rumped Warbler	9	11	8	9	8	12	10	13	11	9	11	14	10	13	9	9	7	12	12	8	5	7	4	9.61	2.54	0.122	-1.17	
Blackpoll Warbler	8	9	9	7	7	15	10	10	9	8	8	3	3	9	8	8	2	4	5	5	1	9	6	7.09	3.15	0.270	-2.42**	
Ovenbird			1						1															0.09	0.29			
Canada Warbler							1																	0.04	0.21			
Lincoln's Sparrow	2					1																		0.13	0.46			
White-throated Sparrow	6	14	14	12	14	13	20	14	19	14	18	11	13	11	10	14	14	12	10	12	8	17	11	13.09	3.30	0.021	-0.50	
Dark-eyed Junco	3	9	6	2	5	5	9	8	7	2	7	6	5	7	4	5	4	6	6	6	6	3	4	2	5.26	2.07	0.069	-1.29
Purple Finch	2	4	1	2	3	2	2	1	4	2	3	4	4	2	1	2	2	4	3			2		2.17	1.30			
White-winged Crossbill					8		1	1																0.43	1.67			
Pine Siskin		1		1		2	1				11						5		1			3		1.09	2.48			
Evening Grosbeak		2																						0.09	0.42			
Species Richness ^a	13	16	15	11	14	15	17	14	15	13	15	12	15	14	11	13	13	11	11	9	11	16	8	13.09	2.43			
Number of Individuals ^a	54	94	69	49	71	78	94	76	78	56	80	61	61	63	56	62	62	60	61	55	36	76	46	64.48	13.73			

^a Does not include counts of Red Squirrel

* P = 0.090; ** P = 0.011

Table 2.2. Maximum counts of individual birds, and population trends from linear regression analysis for the 8 most common species (bold type) at Ranch Brook, 1995-2013. Note that a survey was not conducted in 2004.

Common Name	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)
Eastern Chipmunk													1							0.06	0.24		
Red Squirrel					4		1		7				4							0.89	2.00		
Sharp-shinned Hawk				1							1									0.11	0.32		
Mourning Dove						1	1													0.11	0.32		
Ruby-throated Hummingbird						1														0.06	0.24		
Hairy Woodpecker	1																			0.06	0.24		
Pileated Woodpecker							2													0.11	0.47		
Yellow-bellied Flycatcher	4	4	4	3	3	4	2	4	4		3	2	4	3	2	1	2	3	2	3.00	0.97	0.395	-2.60**
Blue-headed Vireo												1								0.11	0.32		
Red-eyed Vireo				1																0.06	0.24		
Blue Jay	1										1	1		4						0.39	0.98		
Common Raven		4	3	4		4	2						1	1		1		2		1.22	1.56		
Black-capped Chickadee	1												1							0.11	0.32		
Red-breasted Nuthatch	7		2		6		2		2		4		5	1		5		2		2.00	2.38		
Winter Wren	8	3	7	10	9	10	5	5	9		10	11	6	8	5	9	7	8	10	7.78	2.24	0.033	0.99
Golden-crowned Kinglet				1	3	1		3			2	1		2		1			1	0.83	1.04		
Ruby-crowned Kinglet	3		3			3			1		1	1			1					0.72	1.13		
Bicknell's Thrush	5	6	7	5	5	6	2	8	1		8	2	5	5	2	7	4	4		4.56	2.36	0.134	-2.47
Swainson's Thrush	6	15	9	5	3	4	8	11	10		8	5	9	7	3	7	13	12	7	7.89	3.39	0.006	0.61
Hermit Thrush	1		3															1	1	0.33	0.77		
American Robin		2	2	2	1	1	1	1	3		4	5	2	2	3	6	4	2	5	2.56	1.65		
Cedar Waxwing				1			1				1									0.17	0.38		
Nashville Warbler		1	3	2	1	3		3	4		3	2	3	2	1	4	1			1.83	1.38		
Northern Parula									1											0.06	0.24		
Magnolia Warbler	2	4	4	2	3	5	4	2	4		2	3	1	2	2	6	1	1	1	2.72	1.49		
Black-throated Blue Warbler	1																			0.06	0.24		
Yellow-rumped Warbler	5	6	4	5	7	11	9	11	8		4	8	8	6	4	7	6	5	1	6.39	2.55	0.069	-1.53
Blackpoll Warbler	9	9	15	8	3	8	7	8	8		8	10	4	6	6	7		7	5	7.11	3.12	0.274	-2.84*
White-throated Sparrow	22	11	12	9	8	7	7	10	10		7	4	8	4	5	8	7	10	2	8.39	4.29	0.404	-3.59**
Dark-eyed Junco	9	5	3	2	5	2	5	4	4		7	5	1	4	1	5	6	6		4.17	2.33	0.059	-1.91
Purple Finch	2	1	4	4	2	4	4		6					2	1	5	1			2.17	1.95		
White-winged Crossbill	8		2		1		6													0.94	2.29		
Pine Siskin	12		1		7								1		1					1.22	3.15		
Species Richness ^a	19	13	18	17	16	17	18	12	15		17	15	16	16	14	15	11	13	11	15.17	2.41		
Number of Individuals ^a	107	71	88	65	67	75	69	82	82		74	61	62	59	37	79	52	63	36	68.28	17.10		

^a Does not include counts of Eastern Chipmunk or Red Squirrel

* $P = 0.026$; ** $P = 0.005$

Table 2.3. Maximum counts of individual birds, and population trends from linear regression analysis for the 8 most common species (bold type) at Underhill State Park, 1991-2013. Note that surveys were not conducted in 2003, 2005, or 2012.

Common Name	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)
Eastern Chipmunk							3		5				/	1	/		1						/	0.50	1.28		
Red Squirrel							1		3		1		/		/		1	1			1		/	0.40	0.75		
Broad-winged Hawk							1						/		/								/	0.05	0.22		
Mourning Dove									1				/	1	/								/	0.10	0.31		
Yellow-bellied Sapsucker		2		1	1		1	1	1		3		/	2	/		2	3	2				/	0.95	1.05		
Downy Woodpecker							1						/		/		1	1			1		/	0.20	0.41		
Hairy Woodpecker				1			1	1	2				/		/					2	2		/	0.45	0.76		
Northern Flicker				1									/		/								/	0.05	0.22		
Pileated Woodpecker	2	1	1			1							/		/								/	0.25	0.55		
Least Flycatcher													/		/		2						/	0.10	0.45		
Eastern Phoebe												1	/		/								/	0.05	0.22		
Blue-headed Vireo	1	2				1	1			1			/	1	/	2	1	1	3	3			/	0.85	0.99		
Red-eyed Vireo	3	4	4	6	9	8	7	6	10	8	8	7	/	5	/	7	8	6	2	5	4		5	6.10	2.10	0.018	-0.63
Blue Jay	2	1		1		2	2		1	1	2	1	/	1	/		1	1		1			/	0.90	0.72		
American Crow													/		/	1		1			1		/	0.15	0.37		
Common Raven				4	1				1	1			/	1	/						2		/	0.50	1.00		
Black-capped Chickadee		1	1		2	3	3		3	1	1		/		/	2	1	3		2	2		/	1.25	1.16		
Red-breasted Nuthatch							1						/		/								/	0.05	0.22		
White-breasted Nuthatch							1						/	1	/								/	0.10	0.31		
Brown Creeper				1					1	1		1	/	1	/	1	1						/	0.40	0.50		
Winter Wren		6	2	1	5	3	4	6	4	4	3	3	/	3	/	4	2	1			2		6	2.95	1.96	0.028	-1.37
Golden-crowned Kinglet								1					/		/	1							/	0.10	0.31		
Veery	1	1								1			/		/								/	0.15	0.37		
Swainson's Thrush		1		2	4	3		1	4	2	2		/		/	1				2			/	1.10	1.37		
Hermit Thrush		4	1	6	7	3	4	4	2		4	5	/	4	/	4	7	1	4	3	4		1	3.40	2.06	0.000	0.05
Wood Thrush	1	1											/		/								/	0.10	0.31		
American Robin	1			3	3	3	4	2	1	2	1		/	2	/		1				3		/	1.30	1.34		
Cedar Waxwing													/		/							1	/	0.10	0.30		
Nashville Warbler													/		/							1	/	0.05	0.22		
Magnolia Warbler	1				1								/		/	1							/	0.15	0.37		
Black-th. Blue Warbler	4	9	5	6	7	8	6	5	6	5	5	5	/	11	/	15	8	11	5	14	9		9	7.65	3.13	0.278	4.89*
Yellow-rumped Warbler			2	2		2	3	3	1	1	3	2	/		/	1		1	1	1	1	1	/	1.40	1.19		

Continued

Common Name	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)
Black-th. Green Warbler	5	7	6	7	7	7	9	5	8	10	10	8	/	13	/	15	12	10	7	11	14	/	8	8.95	2.87	0.402	4.47**
Blackburnian Warbler											1	1	/		/	1				1			1	0.25	0.44		
Blackpoll Warbler						1	2						/		/									0.15	0.49		
Black-and-White Warbler		3	2	2	4	2	3	2	1	3	4	2	/	1	/	2	3		1	1	2	/	2	2.00	1.12		
American Redstart		4			1	1							/		/									0.30	0.92		
Ovenbird	4	10	11	11	13	12	12	10	13	10	13	6	/	11	/	11	15	14	7	14	10	/	11	10.90	2.73	0.055	0.95
Mourning Warbler													/		/		1	1						0.10	0.31		
Canada Warbler	3	4	4	6	2	4	4	2	2	3	2	2	/		/				1				1	2.00	1.78	0.689	-4.86***
Scarlet Tanager					1				1				/		/	1								0.15	0.37		
White-throated Sparrow	2		2	1	1		1					1	/		/	1		1		1				0.55	0.69		
Dark-eyed Junco		3	1	3	4	3	5	2	2	1	2	2	/	1	/	5	5	2	4	3	1	/	1	2.50	1.50	0.005	0.68
Rose-breasted Grosbeak	4	2		1	3	1	2		1				/		/	1					1	/		0.80	1.15		
Purple Finch						1		1			1		/		/	1	1		1					0.30	0.47		
White-winged Crossbill											2		/		/									0.10	0.45		
Pine Siskin					1						1		/		/									0.10	0.31		
American Goldfinch	1												/	1	/									0.10	0.31		
Species Richness^a	15	19	14	18	20	20	23	16	21	16	20	16	/	17	/	22	18	17	12	17	14	/	14	17.45	2.95		
Number of Individuals^a	35	66	43	62	77	69	77	54	67	53	70	48	/	60	/	81	73	58	39	68	53	/	52	60.25	13.02		

^a Does not include counts of Red Squirrel or Eastern Chipmunk

* $P = 0.016$

** $P = 0.002$

*** $P < 0.0009$

Table 2.4. Maximum counts of individual birds, and population trends from linear regression analysis for the 8 most common species (bold type) at Lye Brook Wilderness Area, 2000-2013. Note that surveys were not conducted in 2012.

Common Name	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)
Eastern Chipmunk	2			1									/		0.23	0.60		
Red Squirrel	1	1											/		0.15	0.38		
Broad-winged Hawk													/	1	0.08	0.28		
Ruffed Grouse	1					2							/		0.23	0.60		
Mourning Dove		1											/		0.08	0.28		
Yellow-Billed Cuckoo									1				/		0.08	0.28		
Barred Owl	1												/		0.08	0.28		
Chimney Swift	2												/		0.15	0.55		
Ruby-throated Hummingbird									1	1		1	/		0.23	0.44		
Yellow-bellied Sapsucker	5	6			2		2	2	5	8	11	2	/	4	3.62	3.33	0.098	14.47
Downy Woodpecker	1		1										/		0.38	0.87		
Hairy Woodpecker	2	1	2					1	1	1		5	/		1.00	1.41		
Unidentified Woodpecker	3												/		0.23	0.83		
Northern Flicker									1				/		0.08	0.28		
Pileated Woodpecker	1		3	1	4	1	1		2	1	2		/	1	1.31	1.18	0.027	-2.90
Eastern Wood-Pewee				1									/		0.08	0.28		
Yellow-bellied Flycatcher							1						/		0.08	0.28		
Least Flycatcher	2												/		0.15	0.55		
Great Crested Flycatcher				1									/		0.08	0.28		
Blue-headed Vireo		1	4	1		1				1		1	/	2	0.85	1.14		
Red-eyed Vireo	10	6	9	4	6	6	4	5	13	14	10	15	/	11	8.69	3.82	0.295	10.19*
Blue Jay		3		1		1			2	1	3	1	/		0.92	1.12		
Common Raven					1	1							/		0.15	0.38		
Black-capped Chickadee	1	1		2			1	2	1		1	1	/		0.77	0.73		
White-breasted Nuthatch						1	1						/	1	0.23	0.44		
Brown Creeper	1											2	/	1	0.31	0.63		
Winter Wren	7		1		3	1			2				/		1.08	2.02		
Ruby-crowned Kinglet						1						1	/		0.15	0.38		
Veery					1								/		0.08	0.28		
Swainson's Thrush	2		1	3	2		2	1	1	2			/	1	1.15	0.99		
Hermit Thrush	4	2	6	5	4	4	4	5	6	7	8	2	/	2	4.54	1.90	0.002	0.52
American Robin	1		1		3			1	1		2	2	/		0.85	0.99		
Cedar Waxwing	1								1				/		0.15	0.38		
Nashville Warbler													/	1	0.08	0.28		

Common Name	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	Mean	SD	r ²	Annual Trend (%)
<i>Continued</i>																		
Northern Parula				3	1										0.31	0.85		
Magnolia Warbler	1		3												0.31	0.85		
Black-throated Blue Warbler	9	7	10	9	8	12	11	8	8	8	5	7		3	8.08	2.36	0.355	-3.31**
Yellow-rumped Warbler	2	1				0				1		1			0.38	0.65		
Black-throated Green Warbler	8	10	4	6	8	9	12	3	11	9	6	10		5	7.77	2.77	0.001	-0.24
Blackburnian Warbler	5														0.38	1.39		
Black-and-White Warbler														1	0.08	0.28		
American Redstart	2	1	3	1		4									0.85	1.34		
Ovenbird	15	13	19	11	14	13	12	12	8	12	10	10		12	12.38	2.69	0.371	-2.67***
Canada Warbler	1														0.08	0.28		
Scarlet Tanager	1		3	2	2	2			1		1			1	1.00	1.00		
White-throated Sparrow	2		2	4		2									0.77	1.30		
Dark-eyed Junco	2	3	1	1	1	4		1			2	1		1	1.31	1.18	0.136	-5.09
Rose-breasted Grosbeak	2	1													0.23	0.60		
Species Richness ^a	28	15	17	17	16	17	11	11	18	13	12	17		16	16.00	4.36		
Number of Individuals ^a	98	58	73	57	60	65	51	41	66	66	61	63		49	62.15	13.65		

^a Does not include counts of Red Squirrel or Eastern Chipmunk

* $P = 0.055$, ** $P = 0.032$, *** $P = 0.027$