

**FOREST BIRD SURVEYS ON MT. MANSFIELD AND UNDERHILL STATE PARK**  
**1999 REPORT TO THE VERMONT MONITORING COOPERATIVE**

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*Introduction*

In 1999, breeding bird censuses were conducted at 3 permanent study sites on Mt. Mansfield. Two of these sites, Underhill State Park and Mt. Mansfield Ridgeline, were surveyed for the ninth consecutive year, while the third study site in the Ranch Valley, was censused for the fifth consecutive year. The Underhill State Park site consisted of mature northern hardwoods at an elevation of 2200 feet, while the Mt. Mansfield Ridgeline site, at 3800 feet, consisted of montane spruce-fir. The Ranch Brook site ranged between 3200 and 3600 feet, and was dominated by a paper birch-spruce-fir canopy. These three study sites are part of a long-term Forest Bird Monitoring Program (FBMP) conducted by the Vermont Institute of Natural Science (VINS). 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. As of 1999, VINS had established 34 monitoring sites in 9 different forested habitats in Vermont, as well as at sites in New York and Massachusetts.

*Methods*

Surveys were conducted by VINS staff biologists at the Mt. Mansfield Ridgeline and Ranch Brook sites, and by a skilled volunteer at the Underhill State Park site. 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 (<1min.) 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 were careful to record individuals only once. To reduce duplicate records, individual birds were mapped on standardized field cards and known or presumed movements noted. Different symbols were used to record the status of birds encountered (i.e., singing male, pair observed, calling bird, etc.).
- 3) Each site, consisting of 5 point count stations, was sampled twice during the breeding season; once during early June (ca. 2-12 June) and once during late June (ca. 14-25 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 trend estimates were calculated for the most commonly encountered species at each of the 3 study sites using simple linear regression.

### *Results*

A combined total of 50 species was detected during breeding bird surveys at three study sites on Mt. Mansfield. The two spruce-fir sites had similar species richness, with 28 and 27 species detected at Mt. Mansfield Ridgeline and Ranch Brook respectively. Surveys at Ranch Brook averaged a greater number of individuals and species per year than the higher elevation and more exposed montane Ridgeline site (Tables 1 and 3). The mid-elevation, northern hardwood site at Underhill State Park yielded the highest species richness, with a total of 38 species encountered since 1991 and an average of 18.44 species per year (Table 5).

On the Mt. Mansfield Ridgeline plot in 1999, both overall numerical abundance and species diversity were above the 9-year average, with 78 individuals of 15 species detected (Table 1). Although 5 of the 8 most commonly recorded species were above the 9-year average, only White-throated Sparrow and Purple Finch showed increases over 1998 totals (Table 2). Population trends for the 8 most common species over the 9-year period were relatively stable, with 5 species showing slight increases and 2 slight declines (Table 2). Only 1 species, White-throated Sparrow, showed a significant change in relative abundance during the period with an annual increase of 1.08 ( $P = 0.024$ ).

At the Ranch Brook study site in 1999, the number of individuals was below the 5-year average while species diversity was above average, with 67 individuals of 16 species detected (Table 3). Of the 8 most common species, 5 were below the 5-year average in 1999, and only Yellow-rumped Warbler and Slate-colored Junco increased over 1998 counts (Table 4). Between 1995 and 1999, 6 species showed population declines, although only White-throated Sparrow was significant ( $b = -3.00$ ;  $P = 0.070$ ) (Table 4).

At Underhill State Park, both overall numerical abundance and species diversity were above the 9-year average, with 67 individuals of 21 species encountered (Table 5). Four of the 8 most common species were recorded above the 1991-1999 average (Table 6). Two of these species, Red-eyed Vireo and Ovenbird, were observed at or above their maximum counts and showed significant population increases over the 9-year period ( $b = 0.70$ ;  $P = 0.10$ ; and  $b = 0.65$ ;  $P = 0.058$  respectively). The population trend estimates for the other 6 species were relatively stable (Table 6).

Among the most commonly encountered species, only Winter Wren and Slate-colored Junco were recorded at all 3 study sites. Although counts of Winter Wren fluctuated widely during the period, these annual changes were consistent among the 3 sites. This trend was reflected on a broader geographic scale when Winter Wren counts from 9 other Vermont FBMP sites surveyed between 1991 and 1999 were plotted along with the Mt. Mansfield data (Figure 1).

### *Discussion*

Bird surveys on Mt. Mansfield are beginning to show some interesting patterns, and the population fluctuations evident for some species underscore the need for continued monitoring and development of a long-term database. However, with 9 years of data at the Ridgeline and Underhill study sites, and only 5 years of data at the Ranch Brook site, population trend estimates must be interpreted carefully. Changes in population trends may simply reflect natural fluctuations, variable detection rates, and/or a variety of dynamic factors, such as prey abundance, overwinter survival, and habitat change. Several years of additional data collection, their correlation with other VMC data, and comparison with census data from other ecologically similar sites will be necessary to elucidate meaningful population trends of various species at these sites.

The trends presented here are preliminary, short-term trends from a limited geographic sample. By combining these data with the larger FBMP dataset, more robust trend estimates would be produced. This is supported by results from exploratory power analyses of FBMP data which suggest that for

common species with low variability, 10 years of data from at least 10 study sites are needed to detect relatively small (2-3%) changes with a high (>80%) probability. Common species with high variability would require 15 years of monitoring at 10 study sites to detect similar population changes with accuracy (Faccio et. al. 1998). We are currently finishing data entry of the entire FBMP Access database through 2000, and will have error checking and updated trend estimates for all species completed by March 2001.

The conflicting trends for White-throated Sparrow at the Ridgeline and Ranch Brook study plots are particularly interesting. Between 1991 and 1999, White-throated Sparrows on the Ridgeline increased by 1.08 birds per year (Table 2), while from 1995-1999 they declined by 3 birds per year on Ranch Brook (Table 4). This apparent disparity could be the result of any one of several factors including the difference between the survey time periods, habitat differences between the 2 sites, and/or observer differences. Although both study sites are dominated by balsam fir and red spruce, the Ridgeline plot, located in the krummholtz, is subject to smaller scale disturbances primarily from ice and wind damage. The Ranch Brook plot, located at a lower elevation, has trees with a larger basal area and is subject to larger scale disturbances, primarily from windthrow. In addition to habitat differences, the Ridgeline site was surveyed by the same observer in all 9 years, while Ranch Brook had 3 different observers in 5 years.

Winter Wren populations on Mt. Mansfield appear to exhibit a 3-year cycle, with peaks at all 3 study sites in 1992, 1995, and 1998, and low years in 1994, 1996, and 1999 (Figure 1). For a species with such wide annual variability, the synchronization of this cycle among the 3 sites was striking. Remarkably, counts of Winter Wrens at 9 other FBMP study sites in Vermont showed the exact same oscillations in relative abundance, suggesting that their populations may be controlled by landscape-level events such as overwinter survival or food availability, rather than site-specific events such as habitat change.

### *Literature Cited*

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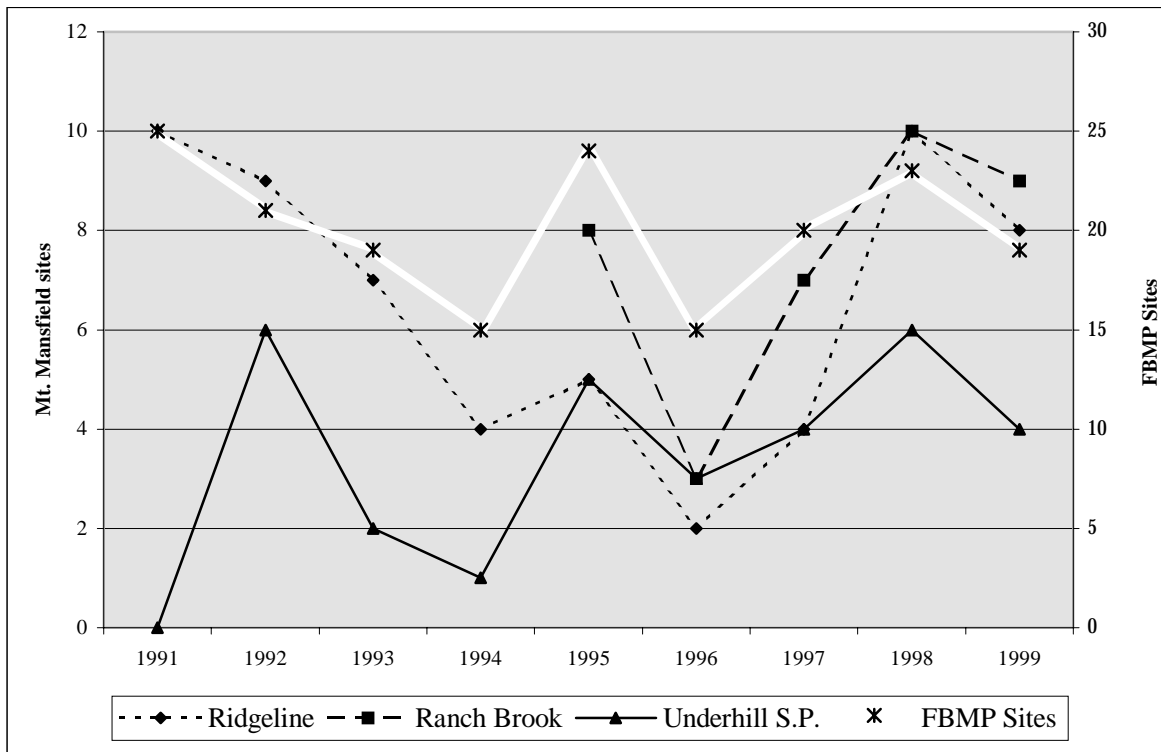


Fig. 1. Max counts of Winter Wrens at 3 Mt. Mansfield study sites and those from 9 other Vermont FBMP sites, 1991-1999.

Table 1. Maximum counts of individual birds at Mt. Mansfield Ridgeline, 1991-1999.

<b>SPECIES</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>Avg/ Year</b>
Hairy Woodpecker				1						0.11
Yellow-shafted Flicker			1							0.11
Yellow-bellied Flycatcher			1		1	2	3		1	0.89
Alder Flycatcher							1			0.11
Red-eyed Vireo									1	0.11
Blue Jay		1								0.11
Common Raven			1			1			1	0.33
Red-breasted Nuthatch	1	2	3	1	3	1		1	2	1.56
Winter Wren	10	9	7	4	5	2	4	10	8	6.56
Ruby-crowned Kinglet		2			1					0.33
Bicknell's Thrush	6	15	11	8	10	11	9	9	8	9.67
Swainson's Thrush	3	8	1	1	3	6	7	5	4	4.22
American Robin	1	4	1	2	2	2	2	1	1	1.78
Cedar Waxwing		1	4				9			1.56
Nashville Warbler	2					2	3	1	1	1.00
Yellow-rumped Warbler	9	11	8	9	8	12	10	13	11	10.11
Magnolia Warbler	1	2				3	1	1		0.89
Blackpoll Warbler	8	9	9	7	7	15	10	10	9	9.33
Ovenbird			1						1	0.22
Canada Warbler							1			0.11
White-throated Sparrow	6	14	14	12	14	13	20	14	19	14.00
Slate-colored Junco	3	9	6	2	5	5	9	8	7	6.00
Lincoln's Sparrow	2					1				0.33
Pine Grosbeak					1					0.11
Purple Finch	2	4	1	2	3	2	2	1	4	2.33
White-winged Crossbill					8		1	1		1.11
Pine Siskin		1					2	1		0.44
Evening Grosbeak		2								0.22
Number Of Individuals	54	94	69	49	71	78	94	76	78	73.67
Number Of Species	13	16	15	11	14	15	17	14	15	14.44

Table 2. Maximum counts and population trends of the 8 most common species at Mt. Mansfield Ridgeline, 1991-1999.

<b>SPECIES</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>Avg/ year</b>	<b>Trend</b>
Winter Wren	10	9	7	4	5	2	4	10	8	6.56	-0.22
Bicknell's Thrush	6	15	11	8	10	11	9	9	8	9.67	-0.18
Swainson's Thrush	3	8	1	1	3	6	7	5	4	4.22	0.20
Yellow-rumped Warbler	9	11	8	9	8	12	10	13	11	10.11	0.35
Blackpoll Warbler	8	9	9	7	7	15	10	10	9	9.33	0.28
White-throated Sparrow	6	14	14	12	14	13	20	14	19	14.00	1.08 *
Slate-colored Junco	3	9	6	2	5	5	9	8	7	6.00	0.37
Purple Finch	2	4	1	2	3	2	2	1	4	2.33	0.02

\*  $P < 0.10$

Table 3. Maximum counts of individual birds at Ranch Brook, 1995-1999.

SPECIES	1995	1996	1997	1998	1999	Avg/ Year
Red Squirrel					4	0.80
Sharp-shinned Hawk				1		0.20
Hairy Woodpecker	1					0.20
Great Crested Flycatcher				1		0.20
Yellow-bellied Flycatcher	4	4	4	3	3	3.60
Red-eyed Vireo				1		0.20
Blue Jay	1					0.20
Common Raven		4	3	4		2.20
Black-capped Chickadee	1					0.20
Red-breasted Nuthatch	7		2		6	3.00
Winter Wren	8	3	7	10	9	7.40
Golden-crowned Kinglet					3	0.60
Ruby-crowned Kinglet	3		3			1.20
Bicknell's Thrush	5	6	7	5	5	5.60
Swainson's Thrush	6	15	9	5	3	7.60
Hermit Thrush	1		3			0.80
American Robin		2	2	2	1	1.40
Cedar Waxwing				1		0.20
Nashville Warbler		1	3	2	1	1.40
Black-throated Blue Warbler	1					0.20
Myrtle Warbler	5	6	4	5	7	5.40
Magnolia Warbler	2	4	4	2	3	3.00
Blackpoll Warbler	9	9	15	8	3	8.80
White-throated Sparrow	22	11	12	9	8	12.40
Slate-colored Junco	9	5	3	2	5	4.80
Purple Finch	2	1	4	4	2	2.60
White-winged Crossbill	8		2		1	2.20
Pine Siskin	12		1		7	4.00
Number Of Individuals*	107	71	88	65	67	79.60
Number Of Species*	19	13	18	17	16	16.60

\* Does not include counts of Red Squirrel.

Table 4. Maximum counts and population trends of the 8 most common species at Ranch Brook, 1995-1999.

SPECIES	1995	1996	1997	1998	1999	Avg/ year	Trend
Yellow-bellied Flycatcher	4	4	4	3	3	3.60	-0.30
Winter Wren	8	3	7	10	9	7.40	0.90
Bicknell's Thrush	5	6	7	5	5	5.60	-0.10
Swainson's Thrush	6	15	9	5	3	7.60	-1.60
Yellow-rumped Warbler	5	6	4	5	7	5.40	0.30
Blackpoll Warbler	9	9	15	8	3	8.80	-1.30
White-throated Sparrow	22	11	12	9	8	12.40	-3.00*
Slate-colored Junco	9	5	3	2	5	4.80	-1.10

\*  $P \leq 0.10$

Table 5. Maximum counts of individual birds at Underhill State Park, 1991-1999.

SPECIES	1991	1992	1993	1994	1995	1996	1997	1998	1999	Avg/ Year
Eastern Chipmunk							3		5	0.89
Red Squirrel							1		3	0.44
Mourning Dove									1	0.11
Broad-winged Hawk							1			0.11
Hairy Woodpecker				1			1	1	2	0.56
Downy Woodpecker							1			0.11
Yellow-bellied Sapsucker		2		1	1		1	1	1	0.78
Pileated Woodpecker	2	1	1			1				0.56
Yellow-shafted Flicker			1							0.11
Red-eyed Vireo	3	4	4	6	9	8	7	6	10	6.33
Solitary Vireo	1	2				1	1			0.56
Blue Jay	2	1		1		2	2		1	1.00
Common Raven				4	1				1	0.67
Black-capped Chickadee		1	1		2	3	3		3	1.44
White-breasted Nuthatch							1			0.11
Red-breasted Nuthatch							1			0.11
Brown Creeper				1					1	0.22
Winter Wren		6	2	1	5	3	4	6	4	3.44
Golden-crowned Kinglet								1		0.11
Veery	1	1								0.22
Swainson's Thrush		1		2	4	3		1	4	1.67
Hermit Thrush		4	1	6	7	3	4	4	2	3.44
Wood Thrush	1	1								0.22
American Robin	1				3	3	3	4	2	1.78
Black-and-White Warbler		3	2	2	4	2	3	2	1	2.11
Black-throated Blue Warbler	4	9	5	6	7	8	6	5	6	6.22
Yellow-rumped Warbler			2	2		2	3	3	1	1.44
Magnolia Warbler	1				1					0.22
Blackpoll Warbler						1	2			0.33
Black-Throated Green Warbler	5	7	6	7	7	7	9	5	8	6.78
Ovenbird	4	10	11	11	13	12	12	10	13	10.67
Canada Warbler	3	4	4	6	2	4	4	2	2	3.44
American Redstart		4			1	1				0.67
Scarlet Tanager					1				1	0.22
White-throated Sparrow	2		2	1	1		1			0.78
Slate-colored Junco		3	1	3	4	3	5	2	2	2.56
Rose-breasted Grosbeak	4	2		1	3	1	2		1	1.56
Purple Finch						1		1		0.22
Pine Siskin					1					0.11
American Goldfinch	1									0.11
Number Of Individuals*	35	66	43	62	77	69	77	54	67	61.11
Number Of Species*	15	19	14	18	20	20	23	16	21	18.44

\* Does not include counts of Red Squirrel or Eastern Chipmunk.

Table 6. Maximum counts and population trends of the 8 most common species at Underhill State Park, 1991-1999.

<b>SPECIES</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>Avg/ year</b>	<b>Trend</b>
Red-eyed Vireo	3	4	4	6	9	8	7	6	10	6.33	0.70*
Winter Wren	0	6	2	1	5	3	4	6	4	3.44	0.15
Hermit Thrush	0	4	1	6	7	3	4	4	2	3.44	-0.11
Black-throated Blue Warbler	4	9	5	6	7	8	6	5	6	6.22	0.00
Black-throated Green Warbler	5	7	6	7	7	7	9	5	8	6.78	0.20
Ovenbird	4	10	11	11	13	12	12	10	13	10.67	0.65*
Canada Warbler	3	4	4	6	2	4	4	2	2	3.44	-0.20
Slate-colored Junco	0	3	1	3	4	3	5	2	2	2.56	0.04

\*  $P < 0.10$