

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

2025 Report to the Forest Ecosystem Monitoring Cooperative



**Figure 1.** White-throated Sparrow on Mt. Mansfield. Photo © Forest Botial-Jarvis CC BY-NC 4.0

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# 1 Demographic Monitoring of Montane Forest Birds on Mt. Mansfield - 2025

## 1.1 Introduction

In 2025, we continued demographic monitoring of Bicknell's Thrush (*Catharus bicknelli*), Swainson's Thrush (*Catharus ustulatus*), Blackpoll Warbler (*Setophaga striata*), Yellow-rumped (Myrtle) Warbler (*Setophaga coronata coronata*), White-throated Sparrow (*Zonotrichia albicollis*), Dark-eyed (Slate-colored) Junco (*Junco hyemalis hyemalis*) and other songbirds, completing our 34th consecutive field season on the Mt. Mansfield ridgeline. This report presents a brief summary of data collected.

## 1.2 Methods

### 1.2.1 General Methods

We used mist-netting and banding to monitor breeding bird species on an established study plot on the Mt. Mansfield ridgeline between c. 1155-1190 m (3800-3900 ft) elevation. As in previous years, we continued our efforts to monitor six common target species: Bicknell's Thrush, Swainson's Thrush, Blackpoll Warbler, Yellow-rumped (Myrtle) Warbler, White-throated Sparrow, and Dark-eyed (Slate-colored) Junco. Since 2012, as a means to more broadly assess population changes and the potential impacts of climatic warming on high-elevation species, our efforts have encompassed the entire avian community.

We netted birds on 33 days between 27 May and 17 Sep 2025. We used 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. We captured Bicknell's Thrush both passively and through the use of vocal lures (recorded playbacks of conspecific vocalizations), while other species were captured passively. 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, molt (if present), and net site of capture. Standard morphometrics included wing chord, tail length, and weight.

### 1.2.2 Biological Samples

In 2023, we initiated the systematic collection of biological samples from our target species, which continued this year. We collected blood samples from White-throated Sparrow, Slate-colored Junco, Myrtle Warbler, Blackpoll Warbler, Bicknell's Thrush, Swainson's Thrush (Table 1.2). Blood samples will be analyzed for carbon and nitrogen stable isotope analysis to reconstruct trophic relationships in relation to source data collected from insect prey and fruit on Mansfield.

We also collected tail feathers from these species to contribute to our long-term data collection. These feathers provide inert information that can be used to genetically sex unknown individuals, assess population genetic structure, and analyze hydrogen isotopes (deuterium) to quantify migratory connectivity.

### 1.2.3 Identifying Migratory Behavior and Stopover Habitat

2025 was the first year of data collection for a new study that is using novel archival barometric pressure tags on Bicknell's thrush and Blackpoll warbler to identify migratory stopover locations and assess vulnerabilities to offshore wind. This work is in collaboration with the National Audubon Society and is funded through grants supplied to VCE from non-FEMC sources.

In September 2025, we deployed 19 barometric pressure tags on Bicknell's Thrush and 20 tags on Blackpoll Warblers (Figure 2) on Mount Mansfield, Vermont. All tracking devices were deployed on adult birds that had been previously banded to ensure they bred on Mount Mansfield and were not migrants from other breeding populations. We used a combination of passive netting and target netting with playback. The archival tags will record barometric pressure, ambient light levels, and accelerometer data. After returning individuals are recaptured during May and June 2026, the data will be analyzed to determine both stopover and non-breeding locations as well as migration phenology.

Various tracking technologies have been used to determine migratory stopover sites and non-breeding locations of Bicknell's Thrush breeding on Mount Mansfield, including light-level geolocators, GPS tags and nanotags. These data have been compiled, and each dataset has been analyzed separately. We've begun integrating movement data to estimate the strength of migratory connectivity between Mount Mansfield and the mid-Atlantic stopover locations, but the analyses are not yet finalized. Once the barometric pressure devices are recovered, we will integrate those movement results into the final analysis.



**Figure 2.** Blackpoll warbler with an archival barometric pressure tag.

### 1.2.3 Physiological Adaptation in High-elevation Birds

From 2024-2025, we partnered with Sarah Deckel, Ph.D., postdoctoral research fellow from Great Hollow Nature Preserve to conduct a study comparing physiological adaptations in Bicknell's Thrush and Swainson's Thrush. Preliminary analyses of the Mansfield Banding data suggest that Swainson's Thrush are increasing in abundance along the ridgeline (unpublished data), possibly increasing opportunities of competitive interactions between the two species. Using data and samples collected by VCE, Sarah is evaluating three physiological metrics in the two *Catharus* thrushes to compare their adaptive capacity in extreme high elevation systems: feather hydrophobicity, mass loss, and metabolic water. Each of these measures provides information about the ability of a bird to withstand the cold temperatures, high humidity, and frequent

precipitation found in high-elevation systems. We are currently awaiting results from the metabolic water analysis. Results from this study will be combined to provide insight into the ability of Swainson's thrush to cohabitat in high-elevation systems and compete with Bicknell's Thrush.

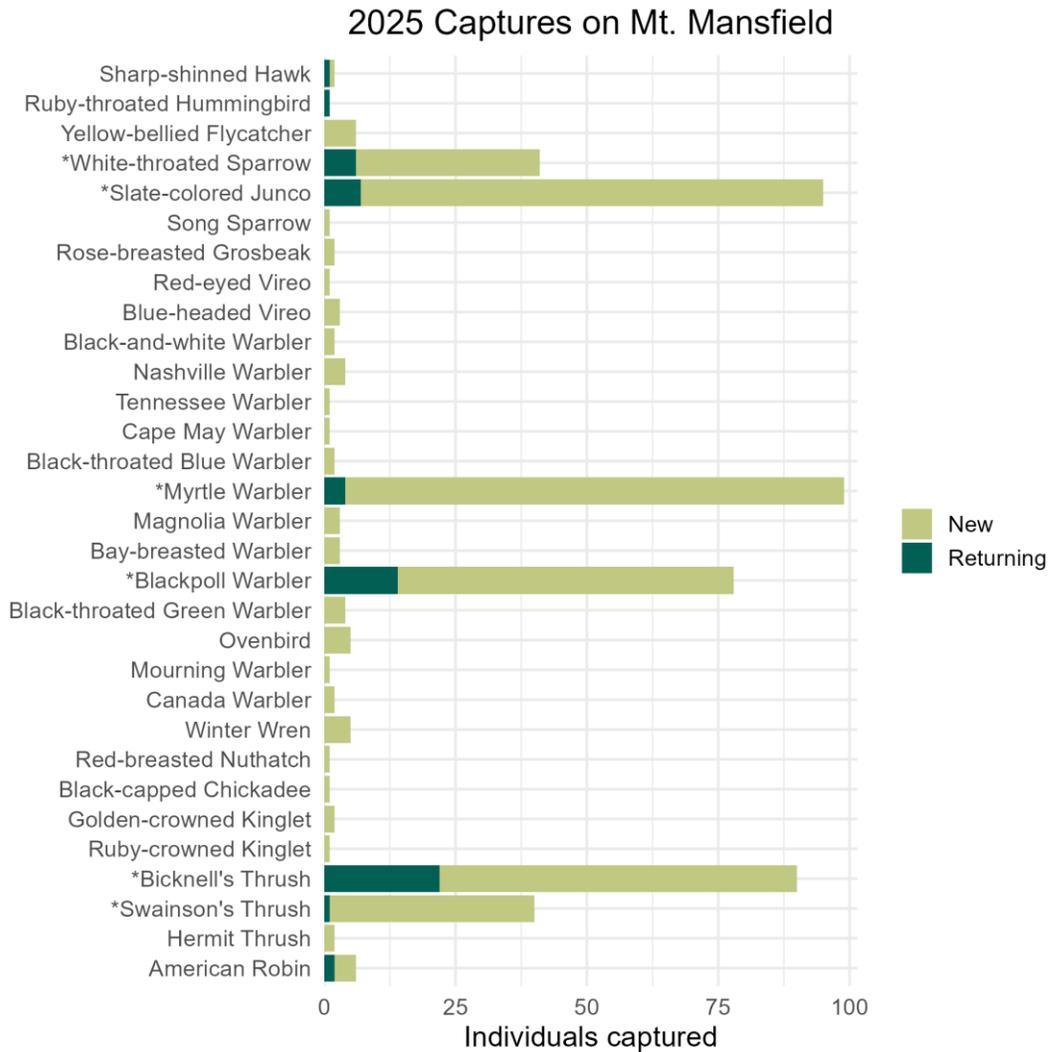


**Figure 3.** Hydrophobicity assay to measure contact angles of water droplets on feathers. This method is used to measure the water repellency of materials and is used in this study to compare feather structure between Bicknell's Thrush, a high elevation specialist, and Swainson's Thrush, an elevational generalist.

### 1.3 Results and Discussion

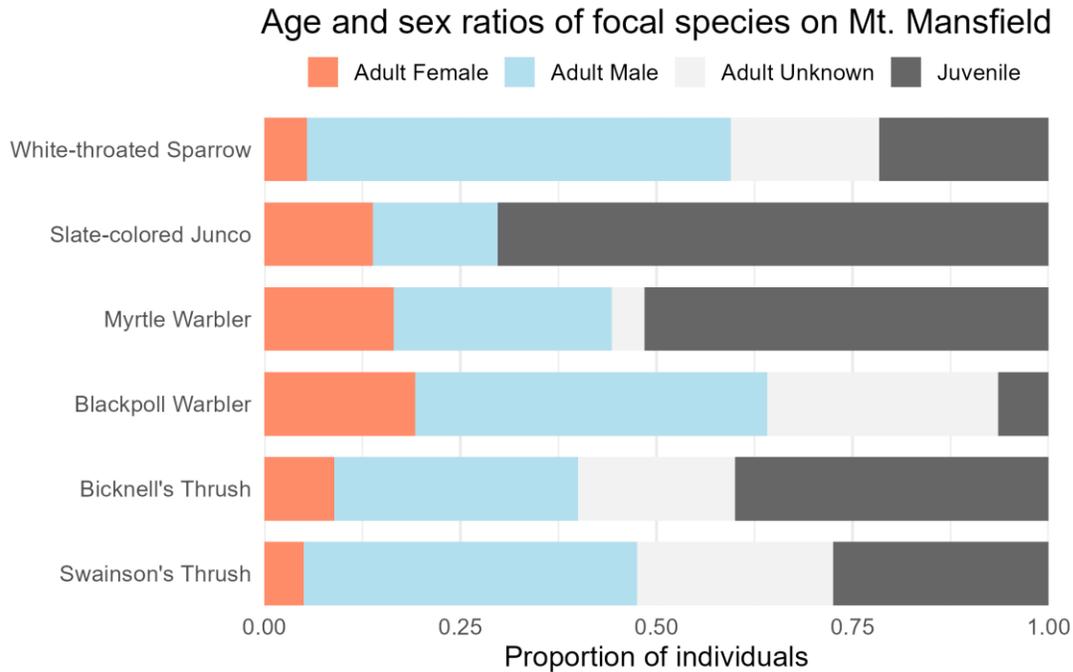
We accumulated 3663.47 net-hours in 2025, with a mean of  $111.01 \pm 82$  SD net-hours per day (range = 0 - 286.67, Table 1.1). Our total of 627 mist net captures consisted of 502 individuals of 31 species, including 447 new birds banded, 55 birds returning from previous years, and 119 within-season recaptures (Figure 1.1). One male Bicknell's Thrush was captured 6 different times over the course of the season.

Bicknell's Thrush had the highest rate of return captures compared to other focal species ( $n = 22$  birds returning; 24% of individuals captured) in 2025. Return rates of other species were 18% for Blackpoll Warbler, 4% for Myrtle Warbler, 2% for Swainson's Thrush, 15% for White-throated Sparrow, and 7% for Slate-colored Junco.



**Figure 1.1.** Numbers of individual birds captured on Mt. Mansfield in 2025. Starred species are the six primary focal species.

Among our focal species, most individuals captured were adults with the exception of Slate-colored Junco, where the majority of captures were of hatch-year (juvenile) birds (Figure 1.2). Ratios of juvenile birds were higher in all species because we continued banding into September. Mist net captures of adult Bicknell’s Thrush continued to show a male-biased sex ratio, with 3.5 males captured for every female among birds of known sex (28 males, 8 females). Most focal species showed adult male-bias in 2025 including Myrtle Warbler (1.7:1 males to female), Swainson’s Thrush (8.5:1), White-throated Sparrow (10:1), and Blackpoll Warbler (2.3:1). Slate-colored Juncos of both sexes were captured at near equal rates (1.2:1).



**Figure 1.2.** Age and sex ratios of birds captured on Mt. Mansfield in 2025. Birds that were not aged (e.g. escaped at net, not attempted, or age indeterminate) have been excluded.

## 1.4 Work Planned in 2026

- Complete 35th consecutive year of weekly field monitoring using mist nets and banding during the 2026 breeding season.
- Recapture birds with barometric pressure tags to recover data on migratory behavior and stopover locations.
- Continue collecting blood and fecal samples from a subset of focal species to continue long-term data
- Complete analyses of community compositional shifts and annual survival from long-term Mansfield banding data for a peer-reviewed paper.

## 1.5 Acknowledgements

We are grateful to Vail Resort for allowing us access to the Mt. Mansfield toll road and to GMC and Vermont Parks and Recreation for overnight use of the stone hut ski building. We sincerely thank our many field assistants and volunteers for their excellent fieldwork. Additional funding for this work was provided by the Oakland Foundation, the state of Massachusetts, and friends of the Vermont Center for Ecostudies.

## 1.6 Tables

**Table 1.1.** Daily net hours (hours per 12-m net) on Mt. Mansfield in 2025.

<b>Date</b>	<b>Net Hours (hrs/12-m net)</b>
05-27-0025	210.20
06-16-0025	75.03
06-17-0025	239.40
06-18-0025	32.42
06-23-0025	78.37
06-24-0025	188.08
05-28-2025	3.17
06-02-2025	73.53
06-03-2025	199.90
06-04-2025	1.00
06-05-2025	1.50
06-12-2025	21.78
06-13-2025	86.75
07-02-2025	74.83
07-03-2025	124.07
07-08-2025	69.17
07-09-2025	128.25
07-14-2025	50.73
07-15-2025	174.65
07-16-2025	108.83
07-22-2025	60.33
07-23-2025	140.52
07-29-2025	63.17
07-30-2025	141.17

<b>Date</b>	<b>Net Hours (hrs/12-m net)</b>
09-02-2025	48.35
09-03-2025	255.82
09-04-2025	118.73
09-08-2025	41.08
09-09-2025	286.67
09-10-2025	199.35
09-16-2025	265.65
09-17-2025	100.97

**Table 1.2.** Number of individuals of each species, from which blood, feathers, or fecal samples were collected on Mt. Mansfield in 2025.

<b>Species</b>	<b>Blood</b>	<b>Feather</b>	<b>Fecal</b>
White-throated Sparrow	16	32	0
Slate-colored Junco	13	77	0
Nashville Warbler	0	2	0
Myrtle Warbler	22	80	1
Blackpoll Warbler	12	70	0
Bicknell's Thrush	35	81	0
Swainson's Thrush	17	35	1

**Table 1.3.** Tags deployed on Mt. Mansfield in 2025.

<b>Species</b>	<b>Tag type</b>	<b>Recovered</b>	<b>Deployed</b>
White-throated Sparrow	motus-nanotag	2	
Blackpoll Warbler	barometric pressure/accelerometer geolocator	0	20
Bicknell's Thrush	barometric pressure/accelerometer geolocator and motus-nanotag	0	19
	motus-lifetag	3	
	motus-nanotag	2	

## 2. Surveys on Mt. Mansfield & Lye Brook Wilderness Area - 2025

### 2.1 Introduction

As part of the Vermont Forest Bird Monitoring Program, we conducted point counts at 27 study sites across Vermont in 2025, including sites on Mt. Mansfield and in the Lye Brook Wilderness Area. Long-term monitoring is essential to assess trends in species presence, species richness, and relative abundance, and can provide meaningful insights into how species respond to ecosystem change, which may include effects from invasive species, climate change, forest fragmentation, and more. This report provides a brief summary of results from two study sites — Underhill State Park on the west slope of Mt. Mansfield and the Lye Brook Wilderness Area east of Manchester, VT.

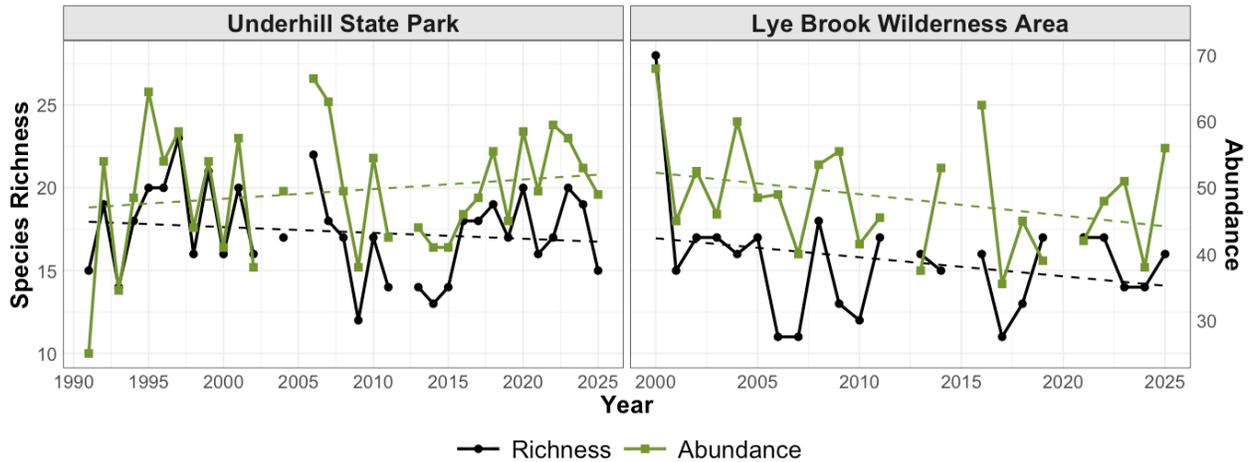
### 2.2 Methods

Breeding bird surveys were conducted at permanent study sites located on the west slope of Mt. Mansfield in Underhill State Park (UNSP) and at the Lye Brook Wilderness Area (LBWA) in the southern Green Mountains. These two study sites are part of VCE's long-term Forest Bird Monitoring Program (FBMP) which 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, Faccio et al. 2017).

Each study site contains five point count stations spaced ca. 150-200m apart. Survey methods include unlimited distance point counts, based on the approach described by Blondel et al. (1981) and used in Ontario (Welsh 1995). Counts begin shortly after dawn on days where weather conditions are unlikely to reduce count numbers. During a 10-min sampling period, divided into 2-, 3-, and 5-minute intervals, observers record all birds seen and heard within two distance categories (within 50m and beyond 50m). Surveys during 2025 represented the 32nd year of data collection at UNSP and the 23rd at LBWA, exclusive of years when no surveys were conducted (2003, 2005, and 2012 at UNSP, and 2012, 2015, and 2020 at LBWA). The results presented here do not account for imperfect detection.

### 2.3 2025 in Summary

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 54 species detected over all survey years at both sites. In 2025, both the abundance of individual birds and species richness continued a relative decline at UNSP, while at LBWA the number of individuals and species richness increased (Fig. 2.1).

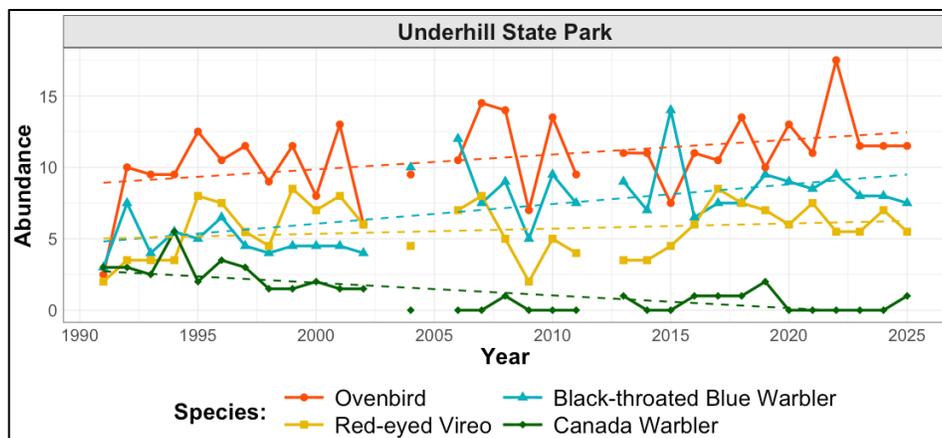


**Figure 2.1** The total species richness and average number of individuals detected per survey at Underhill State Park [1991-2025] and Lye Brook Wilderness Area [2000-2025]. Graphs are not corrected for imperfect detection. Note that values for species richness are on the left vertical axis and abundance are on the right axis. Dashed lines indicate the linear trend.

## 2.4 Long Term Trends

### 2.4.1 Underhill State Park

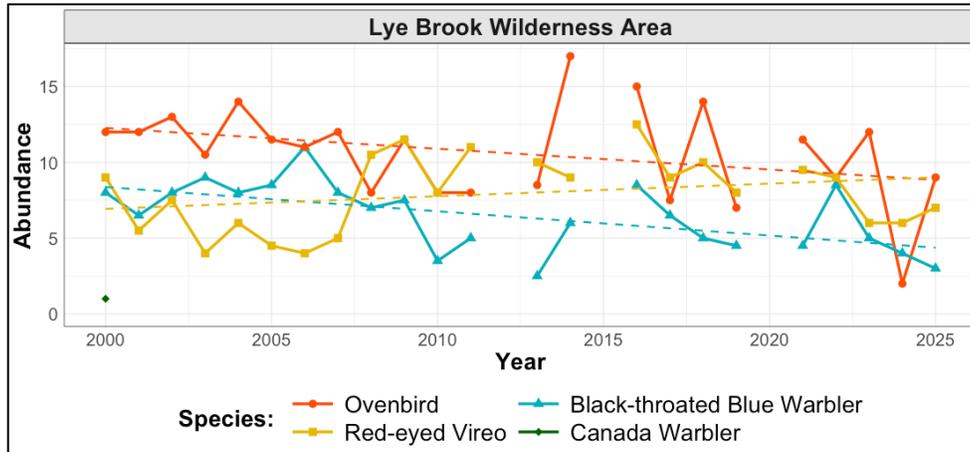
Species richness decreased for the third consecutive year at UNSP, while abundance declined for the second consecutive year (Fig. 2.1). Among the ten most abundant species, four were above or equal to the 32-year mean (Red-eyed Vireo, Black-throated Green Warbler, American Robin, and Winter Wren) while six were below (Blue Jay, Brown Creeper, Ovenbird, Hermit Thrush, Black-throated Blue Warbler, and Dark-eyed Junco). Canada Warbler was detected for the first time since at UNSP since 2019, with a single individual present (Fig. 2.2).



**Figure 2.2** The abundance of four representative species at Underhill State Park [1991-2025]. Graphs are not corrected for imperfect detection. Dashed lines indicate the linear trend.

## 2.4.2 Lye Brook Wilderness Area

There was a relative increase in diversity and abundance at LBWA compared to 2024 (Fig. 2.1). Among the ten most abundant species, five were above or equal to the 23-year mean (American Robin, Red-eyed Vireo, Yellow-bellied Sapsucker, Ovenbird, and Black-throated Blue Warbler) while five were below (Hermit Thrush, Black-throated Green Warbler, Blue Jay, Pileated Woodpecker, and Brown Creeper).



**Figure 2.3** The abundance of four representative species at Lye Brook Wilderness Area [2000-2025]. Graphs are not corrected for imperfect detection. Dashed lines indicate the linear trend.

## 2.5 Implications

Although the relative abundance of the forest bird community over the survey period is trending upward at UNSP and downward at LBWA, the magnitude of these long-term trends is small and neither result is statistically significant (Fig. 2.1). Moreover, it is important to note that site-specific trend estimates must be interpreted with caution, as these data are from a limited geographic sample and can be greatly influenced by years with extreme high or low counts, such as the exceptionally high count for total number of individuals recorded in 2000 at LBWA (see Fig. 2.1), which is largely driving the site's downward trend. Also, year to year changes in survey counts may simply reflect natural fluctuations in abundance, differences in detection rates of observers and/or species, variability of singing rates due to nesting stage, and/or a variety of dynamic factors, such as predator or prey abundance, overwinter survival, effects of diseases such as West Nile Virus, and local habitat change.

Not surprisingly, most of the strongest population trends observed at both study sites—including the increasing trend of Red-eyed Vireo at LBWA (Fig. 2.3), and the declining trend of Canada Warbler at UNSP (Fig 2.2)—reflect the broader state-wide trends for these species during the 25-year study of the Vermont Forest Bird Monitoring Program (Faccio et al. 2017).

It is unknown which of the many anthropogenic stressors (e.g., habitat degradation and loss due to development, land use change, acid precipitation and other atmospheric pollutants, or changing climatic conditions) may be contributing to these population trends, but it is likely all

have had impacts. In addition, migratory species, whether short-distance or long-distance Neotropical migrants, have declined across Vermont forests, while year-round residents, as a group, showed no significant trend (Faccio et al. 2017). This suggests that migratory species face additional limiting factors, both on their wintering grounds and during migratory stopover that could be impacting populations. Continued data collection and comparison with survey data from other ecologically similar sites will be necessary to fully elucidate population trends of various species at these sites.

## 2.6 Future Directions

The vegetative composition and structure at 20 established FBMP transects was sampled between 1995 and 2002 (Faccio 2003, Chace et al. 2009), including both Underhill State Park and Lye Brook Wilderness Area. With the discovery of Beech Leaf Disease (BLD) at the Little Ascutney Wildlife Management Area FBMP survey transect in 2025, we aim to resurvey the vegetation of FBMP plots in anticipation of BLD spreading statewide. This will not only allow us to quantify changes in forest vegetation structure, species composition, and carbon sequestration over the past two decades, but will also provide a pre-BLD baseline to facilitate follow-up surveys that quantify the impact of BLD on long-term bird trends.

## 2.7 Acknowledgements

Many thanks to FBMP volunteers Jason Crooks, who has surveyed Underhill State Park every year since 2013, and Sam Hayden, who has surveyed Lye Brook Wilderness Area for the last three years. Their efforts and attention to detail is much appreciated.

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