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May 6, 2025

Stopover migration in the Shawangunk Ridge

Abstract

This study aims to quantify the amount of stopover migrants that pass through the Shawangunk Ridge, as a way to assess the habitat quality. Point counts were completed from April 15-30 between the times of 7:00-9:00 AM. Categorization of stopover/breeding migrants completed using abundance values from range maps sourced eBird. All species abundance increased over the study period, the top five most abundance being American Goldfinch, Chipping Sparrow, Pine Warbler, Yellow-rumped Warbler, and Black-and-white Warbler. Pine Warbler and Yellow-rumped Warbler are stopover migrants and account for much of the stopover migrant abundance. Overall, the number of stopover migrants was much less than the number of breeding/year-round residents. The timing of data collection and migrant categorization methods could have played a role in the inconclusiveness of the data.

Introduction

Many birds around the world migrate seasonally, usually to take advantage of budding fruits, access to insects, and less competition for territory. These migrations take a long time, as they can be days on end for the longest migrations. Birds performing these long-distance migrations require lots of food to build up their fat reserves. Oftentimes, they need to replenish their fuel reserves, so they need stopover habitats. Stopover habitats are areas where birds go to refuel during migration. These areas are crucial for determining population dynamics of many migratory species (Liu 2014). Migratory birds spend up to a third of their life in between their breeding and wintering grounds (Sillett 2002), at these stopover habitats. The quality of stopover habitats is important in determining how many birds will use the area to refuel, some sites will see millions of birds coming through during migration seasons.

There are several key features that determine a high-quality stopover habitat. Concentrations of migratory bird species are found closer to areas with adjacent large bodies of water, such as lakes or rivers. Additionally, the presence of large, forested areas is more likely to attract concentrations of migratory species. In contrast, agricultural lands tend to have much lower concentrations of birds (Bonter 2009). Regardless of quality, any stopover site can be helpful for migratory birds, even small woodlots (Liu 2014).
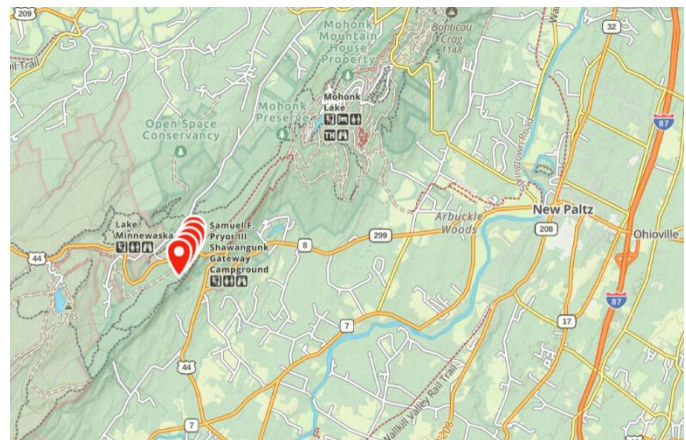
The goal of this study is to assess the stopover habitat quality of the Shawangunk Ridge in New Paltz, NY by quantifying the number of stopover migrants during spring migration. This area is a large, forested ridge with several unique habitats and oligotrophic lakes that support a variety of different plant and animal communities. It

is a long corridor that stretches from New Jersey to Kingston, NY (Open Space Institute). The ridge is well-known for raptor migration, but less is documented about other kinds of species. I hypothesized that during the study period there would be more stopover migrants than breeding/year-round residents. By assessing which birds use this site as stopover habitat, we can better direct conservation and management of the land comprising the Shawangunk Ridge.

Methods

To collect this data, I completed point counts on 5 different points on the ridge. These areas were randomly selected using GaiaGPS about 150 meters apart from each other. All of the points were located on the Mill Brook Ridge trail in Mohonk Preserve (Figure 1). I completed the point counts on five different sampling days between the dates of April 15 to April 30. To complete the point counts, I stood at the point location for 10 minutes, recording all audio and visual detections of all birds within a 50-meter radius of where I was standing. I completed the points in the same order each sampling day, between the times of 7:00-9:00 AM, which are the times when birdsong is most likely to occur.

Figure 1. Map of point counts in relation to New Paltz, NY.

The selection of the trail is relevant to the study due to its unique terrain and ecology. This trail goes along the ridge and is very close to the face of the cliffs.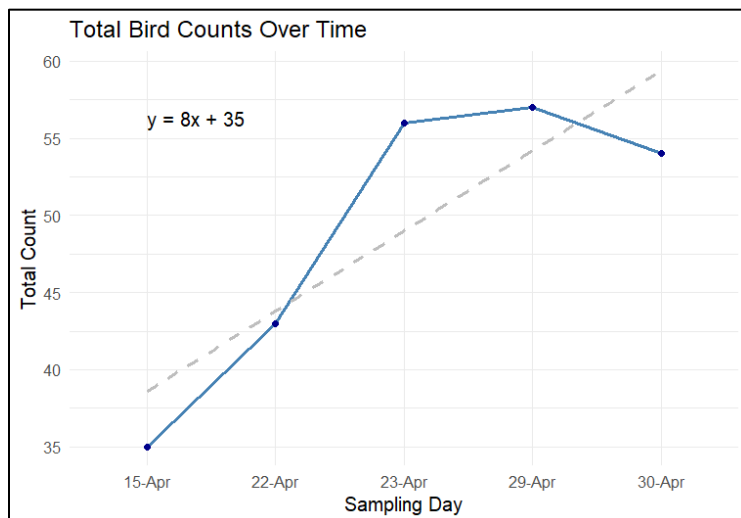 This area is a unique habitat that is composed mostly of pitch pine (*Pinus rigida*), eastern hemlock (*Tsuga canadensis*), and

red maple (*Acer rubrum*). This area has much less canopy cover compared to the lowlands, and the terrain is composed of Shawangunk conglomerate, creating highly acidic soil conditions that support unique species like huckleberries (family Ericaceae) and mountain laurel (*Kalmia latifolia*).

To assess the number of stopover migrants compared to the number of breeding residents, I categorized the detected birds into two categories (stopover and breeding/year-round resident). To do this, I used abundance value on the range maps source from eBird. These range maps are generated from observations from eBird users. The abundance value is a number that quantifies how many of a species one would observe during an hour period, along a 2 km path. I used 0.40 abundance as the cutoff between stopover and breeding/year, and I only used the value from the breeding season. The point count data was input into Excel and then analyzed in RStudio.

Results

Total Bird Counts Over Time

y = 8x + 35

Figure 2. Total count for all species on each sampling day during the point

Over the study period, the number of all bird detections increased (Figure 2) during the sampling days (35, 43, 56, 57, 54, respectively). The top five species detected during the study period were American Goldfinch (*Spinus tristis*), Chipping Sparrow (*Spizella passerina*), PIWA (*Setophaga pinus*), YRWA (*Setophaga coronata*), and BAWW (*Mniotilta varia*), respectively. The species richness is 33

unique bird species. AMGO and YRWA detections were mostly chip calls, not due to song. Additionally, PIWA and YRWA made up the bulk of the stopover migrant count.
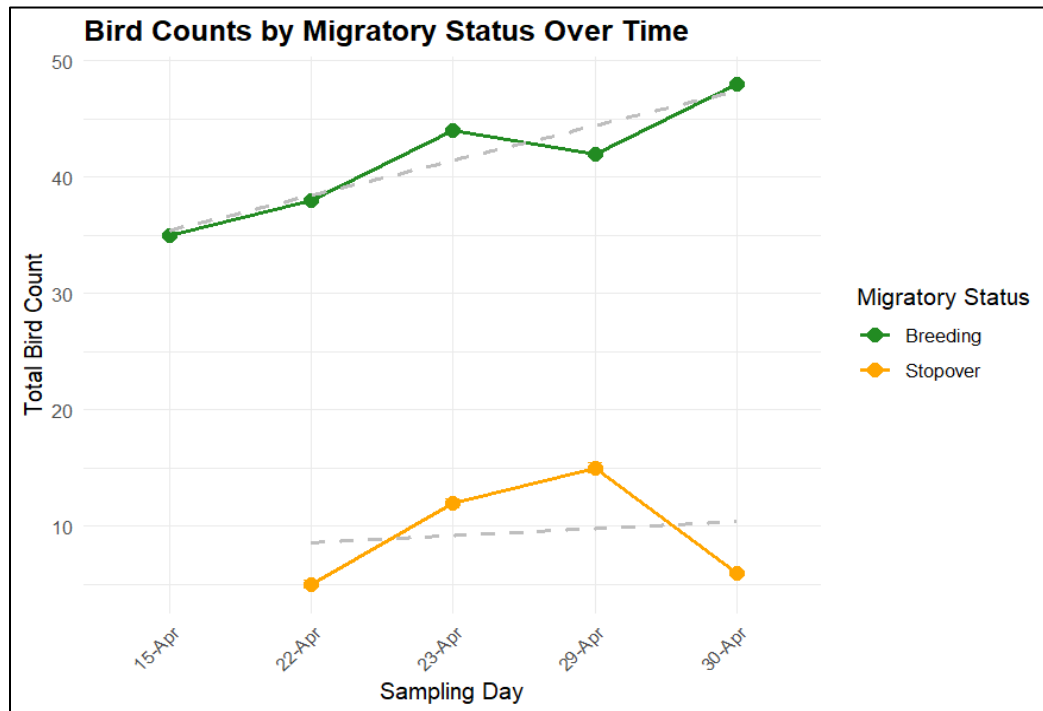
Figure 3. Total counts for breeding species and stopover species during the point counts for each sampling day.

As shown in Figure 3, there were much less stopover species detected than breeding species detected during the study period. There was no stopover species detected on the first day of data collection, but the second, third, and fourth days showed an increasing abundance of stopover species. The trend (gray dashed line) for both breeding and stopover species abundance is increasing. The last day is of special interest because the abundance of breeding species increased whereas the abundance of stopover species decreased to less than half of the number of detections from the previous day.

Discussion

The results of this study do not support the hypothesis that there would be a greater abundance of stopover migrants than breeding/year-round residents on the

Shawangunk Ridge. This framework of the study was based on arbitrary categories that come from the abundance value from eBird range maps. These range maps are fairly accurate, but there is always going to be some level of observer error when it comes to citizen science data. There are not many studies that study migration by grouping birds into categories based on range because we are just now able to use technology to accurately track migratory routes. There are several new GPS technologies that we can use to study bird migration and allow us to generate more accurate range maps.

The bird detections were primarily made up of five species, the top of which being AMGO. These detections are mostly flyover detections, as goldfinches tend to make small chip calls as they fly. The PIWA, the third most abundant bird, initially seemed to me like a breeding resident due to the high rate of song and activity, but their abundance value according to their eBird range map was less than 0.40. YRWA only made chip calls, making the distinction as a stopover migrant easier. The categorization of stopover migrant or breeding/year-round resident is made more difficult by this observation. A better question to perhaps answer before a study like this one is: which birds sing on their stopover habitat? To replicate this study and collect more data, more research needs to be done about singing behavior at stopover habitats. This would make the categories clearer, leading to more accurate data and conclusions.

The data showed that the number of bird detections from all species increased over the study period. This is an expected trend as many birds migrate to and through the northeast during the spring migration season, this is a well-documented phenomenon. Even though there were more detections over the study period, the timing could have been moved forward a few weeks. The low stopover migrant abundance

could be because many of them were not in the region yet. There is evidence of increasing spring arrival of migratory birds by an average of 11.6 days/century (Vitale and Schlesinger 2011), but the study period may have been too early to detect most migrants.

The last day of data for all species did have a dip, and this may have been due to weather. During the last day of data collection, it was quite windy, and some of the songs and chip calls were much harder to hear. Chip calls were important for the data because YRWA, one of the birds that made up the bulk of the stopover migrant count, never sang during the point counts but only made chip calls. There is potential for missed stopover species detections due to the presence of wind.

Other studies have shown qualitative features of stopover habitats that support a greater abundance of birds. Habitats with greater proximity to large forest are correlated with higher arthropod density, which has great importance in explaining migrant density (Butler et al. 2007). Perhaps the Shawangunk ridge, and specifically the points themselves, do not have qualities (such as high arthropod density) to support many stopover migrants.

Point count data is highly variable as there is always going to be some level of observer error, and there was only one observer in this study. Bird identification skills are crucial, especially for identifying individuals only visually or through a chip call. This study needs more data to make any further conclusions about stopover habitat quality of the Shawangunk Ridge, and the next study should begin taking data later, use more accurate GPS generated range maps, over a longer study period.

Citations:

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Appendix

Sampling Day	Plot	Species	Count	Migratory Status
15-Apr	1	PIWA	1	Stopover
15-Apr	1	AMRO	2	Breeding
15-Apr	1	CHSP	1	Breeding
15-Apr	1	BCCH	1	Breeding
15-Apr	1	TUTI	1	Breeding
15-Apr	2	PIWA	2	Stopover
15-Apr	2	AMRO	1	Breeding
15-Apr	2	NOFL	1	Breeding
15-Apr	2	AMGO	2	Breeding
15-Apr	2	DEJU	1	Breeding
15-Apr	3	PIWA	1	Stopover
15-Apr	3	CHSP	1	Breeding
15-Apr	4	PIWA	2	Stopover
15-Apr	4	TUTI	1	Breeding
15-Apr	4	CORA	1	Breeding
15-Apr	4	HOFI	1	Breeding
15-Apr	4	RWBL	1	Breeding
15-Apr	4	NOFL	1	Breeding
15-Apr	4	AMGO	2	Breeding
15-Apr	4	EAPH	1	Breeding
15-Apr	5	WBNU	2	Breeding
15-Apr	5	TUTI	1	Breeding
15-Apr	5	GCKI	1	Stopover
15-Apr	5	BRCR	1	Stopover
15-Apr	5	CHSP	1	Breeding
15-Apr	5	RWBL	1	Breeding
15-Apr	5	NOFL	1	Breeding
15-Apr	5	NRWS	1	Breeding
15-Apr	5	CORA	1	Breeding
22-Apr	1	PIWA	3	Stopover
22-Apr	1	AMGO	2	Breeding
22-Apr	1	BAWW	2	Breeding
22-Apr	1	CHSP	2	Breeding
22-Apr	1	BCCH	1	Breeding
22-Apr	1	TUTI	1	Breeding
22-Apr	2	CHSP	2	Breeding
22-Apr	2	AMGO	1	Breeding
22-Apr	2	BLJA	1	Breeding

Figure 4. Raw data from the study.

Date		Species		Status
22-Apr	2	BAWW	1	Breeding
22-Apr	2	PIWA	1	Stopover
22-Apr	2	TUTI	1	Breeding
22-Apr	2	DEJU	1	Breeding
22-Apr	3	PIWA	2	Stopover
22-Apr	3	BAWW	1	Breeding
22-Apr	3	CHSP	2	Breeding
22-Apr	3	YRWA	1	Stopover
22-Apr	4	AMGO	4	Breeding
22-Apr	4	YRWA	2	Stopover
22-Apr	4	CHSP	1	Breeding
22-Apr	4	BAWW	1	Breeding
22-Apr	4	BGGN	1	Breeding
22-Apr	5	AMGO	2	Breeding
22-Apr	5	PEFA	1	Breeding
22-Apr	5	YRWA	2	Stopover
22-Apr	5	NRWS	1	Breeding
22-Apr	5	WBNU	1	Breeding
22-Apr	5	PIWA	1	Stopover
22-Apr	5	CHSP	1	Breeding
23-Apr	1	AMGO	4	Breeding
23-Apr	1	PIWA	2	Stopover
23-Apr	1	BAWW	2	Breeding
23-Apr	1	CHSP	2	Breeding
23-Apr	1	YRWA	1	Stopover
23-Apr	1	RCKI	1	Stopover
23-Apr	1	PRWA	1	Breeding
23-Apr	2	CHSP	1	Breeding
23-Apr	2	PIWA	2	Stopover
23-Apr	2	BAWW	1	Breeding
23-Apr	2	YRWA	2	Stopover
23-Apr	2	PRWA	1	Breeding
23-Apr	2	NRWS	1	Breeding
23-Apr	2	BCCH	1	Breeding
23-Apr	2	AMGO	2	Breeding
23-Apr	2	PAWA	1	Stopover
23-Apr	2	BTNW	1	Stopover
23-Apr	2	TUVU	1	Breeding
23-Apr	2	CORA	1	Breeding
23-Apr	2	TUTI	1	Breeding
23-Apr	3	YRWA	1	Stopover
23-Apr	3	PIWA	2	Stopover
23-Apr	3	CHSP	3	Breeding

Date		Species		Count	Status
23-Apr	3	BCCH	1	Breeding
23-Apr	3	BAWW	1	Breeding
23-Apr	3	PAWA	1	Stopover
23-Apr	4	YRWA	4	Stopover
23-Apr	4	PIWA	2	Stopover
23-Apr	4	CHSP	1	Breeding
23-Apr	4	TUTI	1	Breeding
23-Apr	5	NOFL	2	Breeding
23-Apr	5	AMGO	3	Breeding
23-Apr	5	NRWS	1	Breeding
23-Apr	5	YRWA	1	Stopover
23-Apr	5	PIWA	1	Stopover
23-Apr	5	BAWW	2	Breeding
29-Apr	1	PIWA	1	Stopover
29-Apr	1	YRWA	2	Stopover
29-Apr	1	WEWA	1	Breeding
29-Apr	1	BAWW	3	Breeding
29-Apr	1	AMGO	1	Breeding
29-Apr	1	PRWA	1	Breeding
29-Apr	1	CHSP	1	Breeding
29-Apr	2	PIWA	2	Stopover
29-Apr	2	YRWA	4	Stopover
29-Apr	2	BAWW	1	Breeding
29-Apr	2	CHSP	2	Breeding
29-Apr	2	WEWA	1	Breeding
29-Apr	2	AMGO	1	Breeding
29-Apr	3	PIWA	2	Stopover
29-Apr	3	YRWA	2	Stopover
29-Apr	3	AMGO	2	Breeding
29-Apr	3	CHSP	2	Breeding
29-Apr	3	BAWW	2	Breeding
29-Apr	3	BCCH	1	Breeding
29-Apr	3	EATO	1	Breeding
29-Apr	4	PIWA	1	Stopover
29-Apr	4	YRWA	3	Stopover
29-Apr	4	BAWW	1	Breeding
29-Apr	4	PRWA	1	Breeding
29-Apr	4	AMGO	2	Breeding
29-Apr	4	CHSP	1	Breeding
29-Apr	4	COLO	1	Stopover
29-Apr	4	EATO	1	Breeding
29-Apr	5	PIWA	1	Stopover
29-Apr	5	WEWA	1	Breeding

Date		Species		Count	Status
29-Apr	5	YRWA	3	Stopover
29-Apr	5	AMGO	3	Breeding
29-Apr	5	CHSP	1	Breeding
29-Apr	5	BAWW	2	Breeding
29-Apr	5	BCCH	1	Breeding
29-Apr	5	EATO	1	Breeding
30-Apr	1	PIWA	2	Stopover
30-Apr	1	EATO	1	Breeding
30-Apr	1	BAWW	2	Breeding
30-Apr	1	CHSP	2	Breeding
30-Apr	1	PRWA	2	Breeding
30-Apr	1	AMGO	1	Breeding
30-Apr	1	WEWA	1	Breeding
30-Apr	2	WEWA	1	Breeding
30-Apr	2	AMGO	2	Breeding
30-Apr	2	YRWA	1	Stopover
30-Apr	2	CHSP	2	Breeding
30-Apr	2	PIWA	2	Stopover
30-Apr	2	BAWW	1	Breeding
30-Apr	2	EATO	1	Breeding
30-Apr	2	YRWA	1	Stopover
30-Apr	2	INBU	1	Breeding
30-Apr	3	CHSP	2	Breeding
30-Apr	3	WTSP	1	Stopover
30-Apr	3	AMGO	1	Breeding
30-Apr	3	BAWW	1	Breeding
30-Apr	4	CHSP	3	Breeding
30-Apr	4	RWBL	1	Breeding
30-Apr	4	BAWW	2	Breeding
30-Apr	4	AMGO	3	Breeding
30-Apr	4	PRWA	1	Breeding
30-Apr	4	TUTI	1	Breeding
30-Apr	4	NRWS	1	Breeding
30-Apr	5	INBU	1	Breeding
30-Apr	5	CORA	1	Breeding
30-Apr	5	PRWA	2	Breeding
30-Apr	5	YRWA	2	Stopover
30-Apr	5	WEWA	1	Breeding
30-Apr	5	BAWW	3	Breeding
30-Apr	5	AMGO	2	Breeding
30-Apr	5	NOCA	1	Breeding
30-Apr	5	EATO	1	Breeding