

# Tiny Bird, Big Commute: How Blackpoll Warbler Abundance Varies between National Wildlife Refuges along the Atlantic Flyway

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## Introduction

The loss of natural habitat is the biggest threat to wildlife worldwide as animals face limited access to food and water, leading to unbalanced ecosystems. Migratory birds, in particular, are significantly affected by this loss as they use fragmented habitats to rest and feed during their long migrations (Andrén, 1994). The 2025 U.S. State of the Birds Report reveals the loss of nearly three billion birds in North America over the past several decades (American Bird Conservancy, 2025). Urbanization is a contributing factor to the loss of natural habitats, resulting in permanent alterations to the types of habitats available and significant changes in species abundance (R.D. Simkin et al. 2022). This is because urbanization reduces the availability of natural habitats, and migratory birds face fewer stopover sites, making conservation efforts a priority.

To mitigate these declines, the National Wildlife Refuge (NWR) System was established in 1903 to conserve and protect species at risk of decline. The National Wildlife Refuges serve as protected green spaces that provide nesting, breeding, resting, and stopover habitat for migratory birds year-round (Fishman, 2005). These establishments, which originated in the nineteenth century, were constructed to protect the natural features and wildlife (Runte 1977, Philips 2004, Watson et al. 2014). The framework for the NWR system was developed in relation to the passing of the Migratory Bird Conservation Act and the Hunting Stamp Act in 1929 and 1934 (Perry 1984).

Each year, billions of migratory birds travel across the Western Hemisphere in response to seasonal environmental cues that lead them to stopover sites. In North America, approximately 75% of the 650 bird species migrate thousands of miles in search of better conditions for survival, utilizing the four major bird flyways: the Central, Pacific, Mississippi, and Atlantic Flyways (Allen et al. 2020). These migratory birds provide ecological services such as dispersing seeds, delivering nutrients as natural fertilizer, and serving as bioindicators of a healthy environment. Because of this, their survival depends on having access to a healthy stopover for the journey ahead. Changes in migratory bird populations can signal changes in the environment across protected green spaces.

Although the NWR system is designed to serve as a sanctuary for migratory species, not much is known about long-term patterns of bird abundance within the refuge along the Atlantic Flyway. Understanding changes in migratory bird abundance is important to evaluate the effectiveness of these conservation efforts. This study investigated the abundance of blackpoll warblers (*Setophaga striata*) across three different sites along the Atlantic Flyway: Savannah National Wildlife Refuge, Occoquan Bay National Wildlife Refuge, and Jamaica Bay National Wildlife Refuge, from March to October over the span of 10

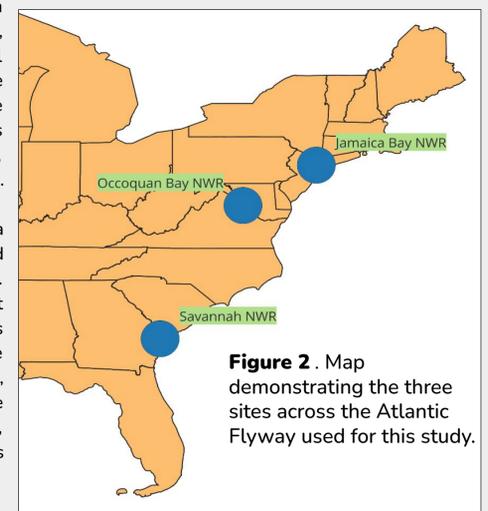
## Methodology

**Study Site Selection**  
 Blackpoll Warblers are long-distance migratory birds that travel between regions of Canada to the northern parts of South America. They rely on green spaces, such as National Wildlife Refuges (NWR), as stopover sites to gain energy during their migration. Three National Wildlife Refuge sites were selected based on the blackpoll warbler migratory route along the Atlantic flyway. The Atlantic Flyway is a migratory bird route that passes through urbanized regions in the eastern United States, mostly along the coast. The sites selected were Savannah Bay (South Carolina), Jamaica Bay (New York), and Occoquan Bay (Virginia).

**Data Collection**  
 This study collected observation data of blackpoll warblers through eBird, an open-access citizen science database managed by the Cornell Lab of Ornithology. eBird was selected because it gives access to long-term data of bird observations across various parts of the world and can be used to compare bird abundance over a long period of time.

A data request was submitted focusing on blackpoll warbler abundance at Savannah, Occoquan Bay, and Jamaica Bay National Wildlife Refuges from 2015 to 2025. After the datasets were downloaded into Excel, they were cleaned to retain only variables and values necessary for this study, such as locality, year, month of observation, and the observation count.

There was an issue with the dataset for Jamaica Bay NWR because observations were reported under different localities: Queens or Brooklyn. Since Jamaica Bay NWR consists of many sites, it spans over both boroughs. Both datasets collected from Queens and Brooklyn were combined into one site based on location. Then, all this data was processed into pivot tables. The pivot tables were created to put together year, site, and month with the observation counts during migration seasons (March to October).



**Figure 2.** Map demonstrating the three sites across the Atlantic Flyway used for this study.

## Abstract

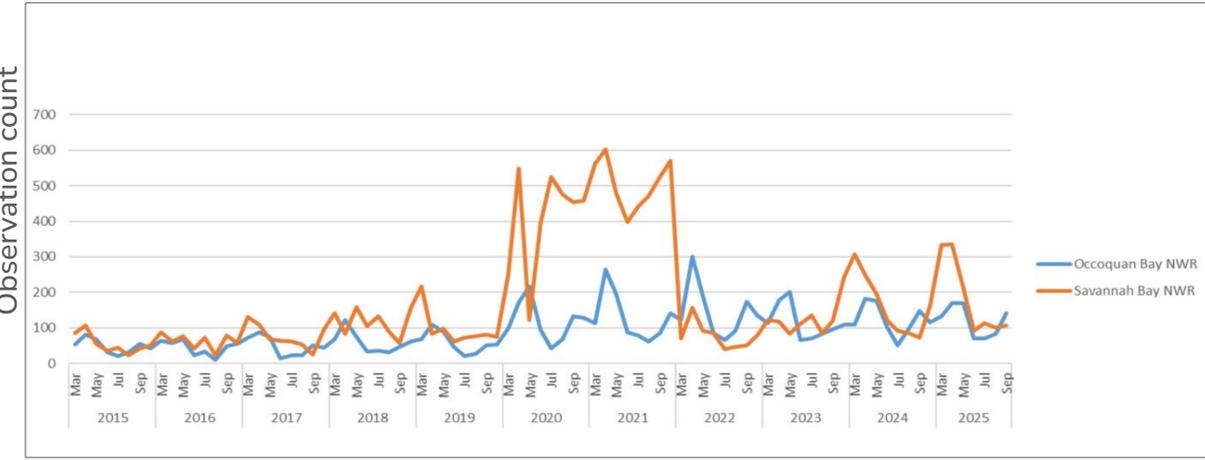
As natural habitats diminish through urbanization, many wildlife, like birds, are negatively impacted by this process. This is especially seen with migratory birds, specifically *Setophaga striata* (Blackpoll warblers), who need forest habitats during the spring and fall migration. National Wildlife Refuges were created to serve as refuge areas for wildlife and to lessen some degree of habitat loss within urban landscapes. These spaces provide temporary habitats for many migratory birds that travel along the migratory pathways, such as the Atlantic Flyway. In this study, we examined the abundance of blackpoll warblers in three specific sites that follow the Atlantic Flyway migratory route, which includes Jamaica Bay, Occoquan Bay, and the Savannah National Wildlife Refuges. The results demonstrated a greater abundance in Jamaica Bay than in the other two sites. This is most likely due to the site's locality and the high number of birders in that area. This study emphasizes the importance of conserving and maintaining National Wildlife Refuges, as they have proven successful in protecting wildlife of all kinds.

## Research Question & Hypothesis

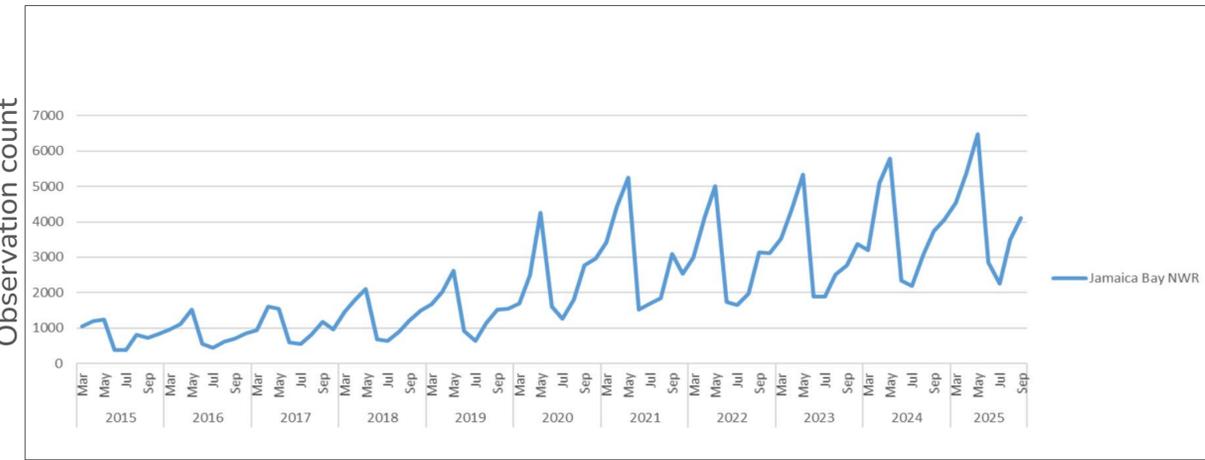
**Question:** How did the abundance of blackpoll warblers vary between different wildlife sanctuaries along the Atlantic Flyway during the migration seasons (spring & fall) from 2015 to 2025?

**Hypothesis:** During the migration seasons (spring & fall), from 2015 to 2025, there would be a higher abundance of blackpoll warblers in Jamaica Bay NWR than in other NWRs given the locality of the site.

## Results & Figures



**Figure 3.** Graph of blackpoll warbler migration season abundance in Occoquan Bay NWR (VA) and Savannah NWR (SC) from 2015 to 2025.



**Figure 4.** Graph of blackpoll warbler migration season abundance in Jamaica Bay NWR from 2015 to 2025. The scale difference emphasizes the significantly higher abundance of blackpoll warblers at Jamaica Bay compared to the other NWR sites.

## Analysis & Discussion

These results support our hypothesis that during spring and fall migration seasons, there would be a higher abundance of blackpoll warblers in Jamaica Bay NWR than in other NWRs, given the locality of the site, from 2015 to 2025. This is because the abundance of blackpoll warbler was ten times higher in Jamaica Bay National Wildlife Refuge, compared to Occoquan Bay and Savannah National Wildlife Refuges. In Figure 4, Jamaica Bay National Wildlife Refuge had higher and more frequent peaks in blackpoll warbler observations during spring migration compared to Savannah and Occoquan Bay National Wildlife Refuges. These variations can be due to the site's differing habitat characteristics. Studies have shown that habitat characteristics are in a positive relation between vegetation and bird species richness (Callaghan et al., 2018). In Figure 3, the graph shows that Savannah NWR had consistently low peaks at the beginning, along with Occoquan Bay NWR & Jamaica Bay NWR. The observation count between 2015 and 2018 was much lower compared to during and aftermath of 2019 was due to eBird's lower popularity among birders.

After 2019, the observations of blackpoll warblers increased by more than several hundred bird observations for Savannah Bay NWR and by about a hundred observation increase in Occoquan Bay NWR. Similarly, there was a huge increase in the observation of blackpoll warblers within Jamaica Bay NWR; it increased by several thousand. Jamaica Bay consistently shows significantly higher counts during both migration seasons compared to the other sites, showing us the effectiveness of its habitat to blackpoll warblers as a stopover site. This can be due to higher numbers of birders in those areas. Studies show that Jamaica Bay NWR specifically, people have observed an impressive number and variety of birds, at all times of year (Thaxton, 1999). Distribution of survey effect is affected by population density, accessibility, and popularity of observation localities, which can create sample biases in the process (Jacobco & Manning, 2025). Jamaica Bay NWR serves as a hotspot in eBird (eBird, 2025). This indicates that the locality of this site influences the bird observations, which shows how blackpoll warblers are seen in the thousands instead of the hundreds like the other two sites.

The original plan was to compare multiple bird species such as waterfowl, songbirds, and shore birds; however, due to time constraints and data modification difficulties, it led to focusing only on blackpoll warblers. Also, using only open-source citizen science data limited the study due to not being able to study the site in person or know the biases behind these observations.

The research question about variation in bird abundance can help better understand the effectiveness of National wildlife refuges for wildlife. As natural habitats are in decline, protected refuges in urban areas are critical for migratory birds, and identifying these stopover sites can help future conservation efforts and management decisions.



**Figure 1.** Map demonstrating the migration path of blackpoll warblers across the Atlantic Flyway (Image Source: BlackPoll Warbler Migration (U.S. National Park Service), n.d.)

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## References

Allen, S. (2021, November 19). Celebrating birds: the phenomenon of migration. Loudoun Wildlife Conservancy. <https://loudounwildlife.org/2020/05/celebrating-birds-the-phenomenon-of-migration/>  
 American Bird Conservancy. (2025, September 29). 2025 U.S. State of the Birds Report Addresses conservation needs across habitats and species - American Bird Conservancy. <https://birds.org/news/2025/09/29/state-of-the-birds-2025>  
 Andrén, H. (1994). Effects of Habitat Fragmentation on Birds and Mammals in Landscapes with Different Proportions of Suitable Habitat: A Review. *Oikos*, 71(3), 355-366. <https://doi.org/10.2307/3587879>  
 Arizaga, J., Resano-Mayor, J., Villanua, D., Alonso, D., Barbarin, J. M., Herrero, A., Lekuona, J. M., & Rodriguez, R. (2017). Importance of artificial stopover sites through avian migration flyways: a landfill-based assessment with the White Stork *Ciconia ciconia*. *Bis*, 16(03), 542-553. <https://doi.org/10.1111/bis.12666>  
 Birding in the big Apple. (1999, December). GALE ACADÉMIC ONEFILE. <https://www.gale.com/academic/onefile/blackpollmigration.html>  
 Callaghan, C. T., Major, R. E., Lyons, M. B., Martin, J. M., & Kingsford, R. T. (2018). The effects of local and landscape habitat attributes on bird diversity in urban green spaces. *Ecosphere*, 9(7). <https://doi.org/10.1002/ecsp.2347>  
 Davis, J. B., Brasher, M. G., & Hagy, H. M. (2024). Sanctuary for migrating and wintering waterfowl: Synthesis and insights for waterfowl and conservation planning. *Journal of Wildlife Management*, 89(9). <https://doi.org/10.1002/wjmg.27207>  
 eBird. (n.d.). eBird passes 2 billion bird observations - eBird. <https://ebird.org/news/ebird-passes-2-billion-bird-observations>  
 eBird. 2021. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: <http://www.ebird.org/>. (Accessed Date: [e.g., February 2, 2021]).  
 Francis, C. D., Ortega, C. P., & Cruz, A. (2009). Noise pollution changes avian communities and species interactions. *Current Biology*, 19(16), 1415-1419. <https://doi.org/10.1016/j.cub.2009.06.052>  
 Jacobo, E. A., & Manning, J. A. (2025). When Birding hotspots get too Hot: A Geographic Evaluation of Wildlife-Related Disturbance on Spatiotemporal Biases in Citizen Science data. *Diversity and Distributions*, 31(4). <https://doi.org/10.1111/ddi.13021>  
 Metler, A. P. (2014). Environmental Indicators of Climate Change: Phenological Aspects. In *Environmental Indicators of Climate Change: Phenological Aspects* (pp. 39-49). [https://doi.org/10.1007/978-94-017-9459-2\\_3](https://doi.org/10.1007/978-94-017-9459-2_3)  
 Simkin, R. D., Seto, K. C., McDonald, R. L., & Jetz, W. (2022). Biodiversity impacts and conservation implications of urban land expansion projected to 2050. *Proceedings of the National Academy of Sciences*, 119(12). <https://doi.org/10.1073/pnas.2117297119>  
 THE BIODIVERSITY AT SANDI BIRD SANCTUARY, HARDOI WITH SPECIAL REFERENCE TO MIGRATORY BIRDS. (2013). In *Octa Journal of Environmental Research* (pp. 173-181) [Journal article]. <https://www.researchgate.net/publication/368670113/Octa>  
 Waller, E. K., Crimmins, T. M., Walker, J. J., Posthumus, E. E., & Weltzin, J. F. (2018). Differential changes in the onset of spring across US National Wildlife Refuges and North American migratory bird flyways. *PLoS ONE*, 13(9). <https://doi.org/10.1371/journal.pone.0202495>