Bird Safe KC.org

2019-2024 Report

Program Objective

To significantly reduce bird mortality caused by building collisions in the Kansas City metro area by the following actions:

- Documenting buildings that are most prone to bird strikes and identifying specific windows or portions of windows that are most problematic.
- Working with building owners and managers to employ cost-effective solutions, such as closing blinds, turning off lights and treating windows at the most strike-prone sites.
- Encouraging tenants and building owners to extinguish lighting at night, particularly during spring and fall migration.
- Raising public awareness of avian window collisions and encouraging personal action in residential as well as commercial settings.
- Publicly commending companies and individuals that take steps to mitigate window strikes.

In this Report

Project Background....2
Methods....2
Comprehensive Data by Species 2019 - 2024....3-6
Comprehensive Data by Route 2019 - 2024....7-9
Bird-friendly and Window Strike Tips....10
References....10

Thanks to BirdSafeKC volunteer surveyors throughout the years!

Armondo Alvarez
Billie Amador
Brett Creason
Briana Anderson
DeAnn Gregory
Elaine Leander
Eric Johnson
Evie Englezos
Frances Cain
Gail Goeke
Hilary Noonan
Janae Hlavacek
Joseph Kempinger
Katie Boord
Karen Townsend
Kathleen Pine
Kenny Snell
Krystal Anton
Kyle Connolly
Magali Rojas
Maria Hedrick
Mary Emmert
Mary Smead
Nicole LaPlante
Patricia Wilson
Paul Holder
Rebecca Boom
Shannon Holder
Steve Rinne
Tabitha Carr
Theresa Enderle
Tracy Lewandowski

BirdSafeKC is a volunteer-driven project coordinated by the nonprofit Missouri River Bird Observatory. BirdSafeKC partners with various conservation organizations, including Burroughs Audubon Society of Greater Kansas City, to raise public awareness of avian window collisions, and is an official Program Partner of Lights Out Heartland.

Contact MRBO Director Dana Ripper (dana.ripper@mrbo.org) or Kansas City Community Conservation Educator Tessa Poolman (tessa.poolman@mrbo.org) for more information.

Project Background

Since the 1970s, about 30% of the North American bird population has been lost. This significant decline is driven by a range of human-caused factors, with window collisions being one of the major contributors. Every year, up to one billion birds die from striking windows. Birds don't have the ability to distinguish the reflection of the trees and vegetation from the window that it is not an open space to fly in. These collisions can occur anytime whether it's in the comfort of your own home, or in urban skyscrapers, however particularly high during migration. While some birds may seem to be unharmed at first glance, most window strikes are fatal. Fully transparent glass with vegetation on either side can cause birds to attempt to fly "through" the building. Highly reflective glass, such as that pictured here, can provide a disorienting view of vegetation that, to a bird, looks real and desirable to reach for foraging or shelter. As a taxonomic group, birds existed for millions of years prior to the proliferation of glass across the planet; it is a potentially lethal barrier to which they are not accustomed. Additionally, many of our most densely populated cities are right in the middle of migratory pathways. The proximity of birds to potential window-strike zones is compounded by the fact that many species migrate at night. The illuminated glow of urban and suburban areas can disorient migrants, particularly on nights with a low cloud ceiling, causing them to descend into developed areas (Parkins et al. 2016).

While avian collisions with windows have been studied intermittently across the US and Canada since the 1960s, most studies were typically small-scale and results were not widely published. However, over the past few years, researchers have been able to extrapolate the results of hundreds of such studies to estimate the nationwide rates of avian mortality from collisions with windows (Loss et al. 2014), around one billion birds. This is in addition to large numbers of mortalities caused by birds colliding with vehicles, communications towers and energy infrastructure, which are significant but not as numerous as window collisions (Loss et al. 2015).

Recent data, extensively publicized by many media outlets in 2019, indicate that North America has lost almost 30% of its birds in the past 50 years (Rosenberg et al. 2019). While there are many causes of this significant decline, one of the most straightforward ways to contribute to bird conservation is to implement minor collision-reducing structural changes to windows on commercial and residential buildings.

Participating in bird monitoring projects, reporting bird sightings, bird counts, and more will help support scientific research and conservation efforts. These initiatives will allow the contributions of valuable observations and data on bird populations, behavior, migration patterns, and habitats. These actions help raise awareness about the importance of bird conservation in local communities.

Methods

Site Selection

Buildings have been selected based on two factors: 1. numerous anecdotal reports of bird carcasses being spotted outside the building and 2. building and landscaping factors that are known to result in window strikes. These factors include window area, transparency and/or reflectivity and proximity and height of surrounding vegetation (Klem Jr. et al. 2009; Hager et al. 2013). Permission to survey individual buildings is requested from management staff and/or volunteers conduct surveys only on public sidewalks.

Photo courtesy of DeAnn Gregory

Survey Methods

Spring and fall migration were selected as the survey seasons due to the significantly higher number of window strikes that occur during these timeframes. Surveys are conducted from 1 April to 15 June, and from 1 September to 15 November. Survey frequency is dependent on volunteer availability, but sites are typically surveyed at least once per week during the mid-morning to early-afternoon hours. The total number of surveys conducted each season is noted as 'survey effort' in the data charts below.

BirdSafeKC surveys follow methodology established by Johnson County Community College (K. Anton 2018, unpub.), Hager and Cosentino (2014) and the American Bird Conservancy (B. Lenz 2019, pers. comm). Surveyors walk the perimeter of buildings and scan within 30 feet of buildings for bird carcasses. Once a carcass is located, surveyors complete a form and take photographs to document the species and specific location of each carcass. These survey data are entered in the smartphone application iNaturalist as well as an Excel spreadsheet to facilitate the compilation of results. Instances when no carcasses are found during a survey are recorded as a zero-bird visit.

Data are compiled by building to display the number of strikes, the average number of strikes per survey day and the windows where strikes occurred. Because there are a number of factors that affect whether or not a carcass remains in place – such as removal by maintenance staff, street-sweeping crews or scavenging by other wildlife species – our estimates of the number of bird strikes are extremely conservative.

Format of this Report

This report combines Spring and Fall 2024 survey data with previously-reported data for 2019 through 2023. One table is presented for all seasons and years, with all sites combined, to give the reader an understanding of the extent of bird collisions just within our limited KC study area. Additional tables present comprehensive data for all seasons for each route and site, along with the most strike-prone windows of each building.

Cover photo: *"Grabbing" a quick bite.* By Lottie Bushmann

Comprehensive Data by Species 2019 - 2024

Species	2019 Total	2020 Total	2021 Total	2022 Total	2023 Total	Spring 2024	Fall 2024	Total
American Coot	1	2	2		1			**6**
American Crow	1							**1**
American Goldfinch	1		4					**5**
American Redstart	1	3	1	1	1		1	**8**
American Robin	10	7	13	1	1	4	1	**37**
American Woodcock	4	5	2	2	3	4		**20**
Bay-breasted Warbler							1	**1**
Black-and-White Warbler	2	4	10	1	4	2	6	**29**
Black-capped Chickadee			1			1		**2**
Black-throated Green Warbler							1	**1**
Blackburnian Warbler			1		1		1	**3**
Blackpoll Warbler		3	3		1			**7**
Blue-headed Vireo			1					**1**
Blue Jay					1			**1**
Blue-winged Teal			1					**1**
Brown Creeper		6	4	2	2	3	3	**20**
Brown Thrasher	2	2	3	1	3	1	2	**14**
Canada Warbler		1	2	1				**4**
Carolina Wren		1					1	**2**
Cedar Waxwing	1	2	8		1			**12**
Chimney Swift	2	3						**5**
Chipping Sparrow	4	2	1	1		1		**9**
Clay-colored Sparrow	3	3	1		1		1	**9**
Common Grackle		1	1			1		**3**
Common Nighthawk			1					**1**
Common Yellowthroat	10	33	33	11	19	6	18	**130**
Cooper's Hawk							1	**1**
Dark-eyed Junco	16	10	16	4	9	3	2	**60**

Comprehensive Data by Species 2019 - 2024 Continued

Species	2019 Total	2020 Total	2021 Total	2022 Total	2023 Total	Spring 2024	Fall 2024	Total
Dickcissel		2						**2**
Downy Woodpecker		2		2	1			**5**
Eastern Phoebe		1						**1**
Eastern Kingbird	1							**1**
Eastern Whip-poor-will						1		**1**
European Starling	3	4	7	3		4	1	**22**
Field Sparrow	1		3		3	1		**8**
Fox Sparrow	2		1	1				**4**
Golden-crowned Kinglet				1				**1**
Golden-winged Warbler			2					**2**
Grasshopper Sparrow	2	4	1		2	1		**10**
Gray Catbird	6	7	7	2	5	3	6	**36**
Great-tailed Grackle		1						**1**
Hairy Woodpecker	1							**1**
Harris' Sparrow	1							**1**
Hermit Thrush		2						**2**
House Finch	1	6	4			2	1	**14**
House Sparrow	3	1	4			4	1	**13**
House Wren	5	7	13	9	18	1	2	**55**
Indigo Bunting	2	8	13	2	1	3		**29**
Kentucky Warbler			1		1			**2**
Killdeer			1					**1**
Least Flycatcher						6		**6**
Lincoln's Sparrow	10	10	9	9	12	1	5	**56**
Magnolia Warbler		2	2	1	1		1	**7**
Marsh Wren	1	4			2		1	**8**
Mourning Dove	9	10	12	2		5	2	**40**
Mourning Warbler	2	4	6	1	1		3	**17**
Nashville Warbler	17	25	20	4	8	5	8	**87**
Northern Cardinal	2	2	2		1	2	3	**12**
Northern Flicker	3	5	2	2	2	2	5	**21**
Northern Parula			1					**1**
Northern Waterthrush		4	3	2	2		3	**14**
Orange-crowned Warbler	4	3	2	1	1	1		**12**
Ovenbird	5	16	21	9	8	2	6	**67**

Comprehensive Data by Species 2019 - 2024 Continued

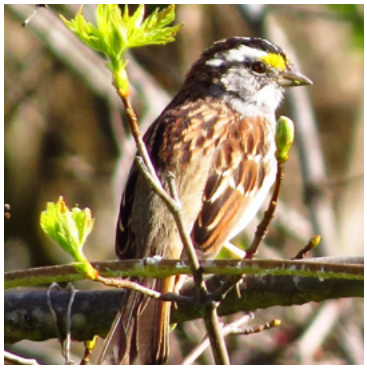
Species	2019 Total	2020 Total	2021 Total	2022 Total	2023 Total	Spring 2024	Fall 2024	Total
Palm Warbler				1	1			**2**
Prothonotary Warbler	1			1				**2**
Red-bellied Woodpecker		1	2	1				**4**
Red-breasted Nuthatch		2	3	3				**8**
Red-eyed Vireo	4	3	6		1	2		**16**
Red-headed Woodpecker	1	3	1		1			**6**
Red-winged Blackbird	2							**2**
Rock Pigeon	3	2	5		1	1	2	**14**
Rose-breasted Grosbeak	3	4	11	2	2	1		**23**
Ruby-crowned Kinglet	1		4					**5**
Ruby-throated Hummingbird	8	10	12	3	4	1	8	**46**
Savannah Sparrow							1	**1**
Scarlet Tanager			1					**1**
Sedge Wren	1	2			1			**4**
Song Sparrow	8	9	9	2	5	1	2	**36**
Sora	2	1		2		1	1	**7**
Summer Tanager	2		3	2	1	1	1	**10**
Swainson's Thrush	10	11	31		2	1		**55**
Swamp Sparrow	10	6	8	3	6	1	2	**36**
Tennessee Warbler	7	13	24	1	4	2	1	**52**
Tufted Titmouse		1						**1**
Unidentifiable	37	38	67	11	39	22	5	**219**
Unid. Flycatcher		10	6		1	1		**18**
Unid. Hawk			1					**1**
Unid. Sparrow		7	3		7		2	**19**
Unid. Swallow			1					**1**
Unid. Swift			1					**1**
Unid. Thrush			7					**7**
Unid. Vireo							1	**1**
Unid. Warbler		10	23	11	15	5	12	**76**
Unid. Woodpecker		1						**1**
Unid. Wren		1		1	1		3	**6**
Vesper Sparrow					1			**1**
Virginia Rail		1	1	1			2	**5**
Warbling Vireo			1					**1**

Comprehensive Data by Species 2019 - 2024 Continued

Species	2019 Total	2020 Total	2021 Total	2022 Total	2023 Total	Spring 2024	Fall 2024	Total
Western Kingbird			1					**1**
Whip-poor-will			1					**1**
White-breasted Nuthatch			1		1			**2**
White-throated Sparrow	23	20	45	12	32	14	7	**153**
Wilson's Warbler	1	3		2	1			**7**
Wood Thrush		1	2	1				**4**
Worm-eating Warbler		1						**1**
Yellow Rail		1						**1**
Yellow Warbler	1	3	4		1	1		**10**
Yellow-bellied Flycatcher			1					**1**
Yellow-bellied Sapsucker	5	3	2	1			5	**16**
Yellow-breasted Chat				1				**1**
Yellow-billed Cuckoo	9	4	8		1	2		**24**
Yellow-shafted Flicker					1			**1**
Yellow-throated Warbler			1					**1**
Yellow-rumped Warbler	1		1	2		1		**5**
Total by Year/Season	**279**	**390**	**544**	**140**	**247**	**128**	**142**	**1870**
Survey Effort by Year/Season	**322**	**400**	**409**	**203**	**366**	**140**	**91**	
Average Carcass Per Survey	**0.87**	**0.98**	**1.33**	**0.69**	**0.67**	**0.91**	**1.56**	

Top 3 Species found on BirdStrikesKC Surveys for 2024

Common Yellowthroat
Photo by Araks Ohanyan



White-throated Sparrow
Photo by Steve Garr

Nashville Warber (and unidentifiable warblers)
Photo by Erik Ost

Comprehensive Data by Route 2019 - 2024

The ultimate goal of BirdSafeKC is to treat high-risk windows to reduce strikes. Therefore, an important part of the data is the section of the building where the most strikes occur, along with window column numbers (see photo at left for example). In all of the following tables, windows where three or more carcasses were found during one season, or more than ten across all seasons, are highlighted in red.

Data shown is cumulative over all seasons. Tracking the amount of survey effort (i.e. number of visits) is crucial to compare relative mortality rates between buildings. The number of times each building was surveyed varies due to owner permission or volunteer availability. Sites with 0.45 or more carcasses documented per survey are highlighted in red; these are sites that could significantly reduce bird mortality by treating certain windows.

Downtown Kansas City

The Downtown North survey route is bordered by 7th Street to the north, Truman Street to the south, Main Street to the west, and Cherry Street to the east. Downtown South surveys covered several buildings between 13th Street to the north and 18th Street to the south. With a few exceptions, surveys were done on public sidewalks only, therefore some sides of buildings were inaccessible. We note that street-sweeping by the KC Downtown Community Improvement District and by private contractors likely means that fatal bird collisions on these survey routes are underestimated. Additionally, BirdSafeKC volunteers were denied access to the main public entrance of 1001 Locust in May 2021; this has likely resulted in a continued undercount at that site. Downtown routes will remain a survey priority in 2025 and will include the same buildings as 2024.

Downtown North Route

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
720 Main	237	62	0.26	E1, W1, S1, S2, S4
1100 Main	255	55	0.22	E1, E3, N2, N5, W6
1200 Main	276	88	0.32	E1, E2, E3, E4, E5, N8, W2, W3
1000 Walnut	257	33	0.13	E8, E9, E11, N4, N6, N8, W1, W6
1100 Walnut	268	51	0.19	East side, Entrance, S8, S10
1101 Walnut	200	60	0.30	South side, NW1
1201 Walnut	263	71	0.27	N3, N4, N6, N7, N8, W3, W4, B4
1001 Locust	300	134	0.45	E1, N1, N2, W1, W2, W4, Courtyard
Various buildings (incidentals)		83		

Downtown South Route

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
1601 McGee	394	198	0.50	patio area, northeast treed alcove, west side
1741 McGee	297	34	0.11	1N, 2S, 2W, 3W, 4W, 5W, S1
1407 Grand	338	222	0.66	E2, E3, E4, E5, E6, E7, N1, N2, N3, N4, W1
1624 Grand	34	3	0.09	S1
1707 Grand	32	6	0.19	N1, S1
Various buildings (incidentals)		33		

Crown Center

Reports of window strikes at Crown Center have been circulating in the Kansas City community for years. Standardized surveys have shown that there are several extremely strike-prone locations in this area of the city. The buildings and structures included on this route have varied slightly by season and volunteer availability, but portions of Crown Center were surveyed during both migration seasons in 2019 through 2024. This route remains a survey priority in 2025.

Building/Structure	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
Link 1	209	52	0.25	E16, E20, E21, N7, S8, W3, W6
Link 2	202	15	0.07	S6, S8
Link 3	305	142	0.47	E17
2501 McGee	310	155	0.50	N16, E24
2450 Grand	170	10	0.06	E9, E11, S1
2380 McGee	42	10	0.24	No pattern discernable; removed from route in 2022
2323 Grand	42	23	0.55	N16, S1, S2, S3, W7, W8; removed from route in 2022
2345 Grand	65	50	0.77	N3, W2, W5; removed from route in 2022
2400 Pershing	36	8	0.22	N5
1 E Pershing	39	6	0.15	N14
Various buildings (incidentals)		63		

Cliff Drive Buildings

Mirrored buildings, coupled in some cases with vegetation at a distance likely to be dangerous to birds, led to the decision to survey several Cliff Drive buildings in Independence, MO beginning in 2019 and continuing through 2021. A change in ownership at Cliffview Professional Building during the Summer of 2021 resulted in the temporary suspension of surveys during fall 2021. Permissions for two buildings was given in early 2022 and steady surveys began again and plan to be continued through 2025.

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
4721 Cliff	108	21	0.19	E1, E2, S5, W1, W3; removed from route in 2022
4801 Cliff	283	64	0.23	A3, B1, B3, B4, B6, B8, B9
4741 S. Cochise	292	99	0.34	N1, N2, N3, S1, S2, S3, W1, W5

Ward Parkway

The Ward Parkway route was established in Spring 2019 due to the configuration of landscaping with mirrored buildings. While several buildings on this route have shown relatively low window strike frequency, two buildings have some of the highest rates in the BirdSafeKC dataset. Unfortunately, permission to survey those two buildings was withdrawn by the property managers. This route was discontinued in 2023 and will not be surveyed in 2025.

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
9200	69	7	0.10	W2, NE1
9221	11	9	0.82	No pattern discernable; not surveyed since October 2019
9229	63	19	0.30	N1, N2, N8, S1, S3, W2
9233	78	25	0.32	N2, N4, S1, S2, S3, S4, S6, W2
9237	14	15	1.07	No pattern discernable; only surveyed in Fall 2020

Heartland Financial

Anecdotal reports of bird carcasses from tenants at the Heartland Financial building prompted surveys in both seasons 2019, fall 2020, and spring 2021. Regular surveys showed that the building has a moderately high strike rate. Permission to survey the building was withdrawn fall 2021, and the building has not been surveyed since.

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Windows
1600 NE Coronado	62	22	0.35	South and west sides; Removed from route in 2021

West Country Club Plaza

Several buildings just west of Country Club Plaza have been reported as potentially dangerous to birds. Surveys in fall 2020 and 2021 indicated that one of the three (4520 Madison) had very few strikes despite its mirrored exterior and nearby vegetation. Anecdotal reports for several years leading up to 2020 suggested that 4600 Madison was moderately strike-prone, however our survey data show that it is less so than many other buildings. The highly mirrored building at 900 W. 48th Place does show relatively high rates of window collisions during migration, particularly on the north side of the building. For that reason, and with confirmed permission, 900 W. 48th was the only building on this route for both seasons in 2023. This route was discontinued in 2024 and will not be surveyed in 2025.

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
4600 Madison	72	12	0.17	A3, E1, E2, E4, S3, S5, W3, W4; removed from route in 2022
900 W. 48th Place	78	44	0.56	N2, N3, E5

Holmes Road/Executive Hills

The Holmes Road/Executive Hills area contains 8-10 completely mirrored buildings within a landscape that is potentially attractive to foraging birds. Permission to survey around buildings has varied across sites and seasons; this route has previously encompassed four additional buildings.

10450 Holmes Rd. was surveyed regularly in Spring 2019, while several other nearby buildings were surveyed intermittently. Preliminary data indicate that at least one portion of 10450 Holmes Rd. - the glass walkway or "link" between the building and the parking garage - is extremely strike-prone. Intermittent surveys were done at ths site throughout 2020 and 2021 before permission was withdrawn. Surveys at 1200 and 1300 104th Street occurred intermittently in Spring 2019, and regularly during 2021. Data indicate that they are moderately strike-prone, particularly parts of the 1300 building. Due to ongoing construction at 1200 104th, it was removed from the route for the 2023 seasons. This route was discontinued in 2024 and will not be surveyed in 2025.

Building	Total # Visits	Total Carcasses	Carcasses/ Survey	Problematic Sections/Windows
10450 Holmes	22	23	1.05	Link; removed from route in 2022
1200 104th	53	15	0.28	E1, E2, S3
1300 104th	52	20	0.38	SE1, SW2

Consider supporting the BirdSafeKC project!

- If you are a KC resident, please spread the word about the BirdSafeKC project - share this report with others
- Consider donating to the BirdSafeKC project at mrbo.org/supportMRBO. Though surveys are conducted by volunteers, funds are needed for project coordination, data compilation and report production.
- If you are a commercial building owner or property manager in KC, we would be delighted to work with you to reduce bird strikes on your structure! Contact tessa.poolman@mrbo.org to get started.

Together, we can save hundreds of birds each year in the Kansas City metro.

Bird-friendly and Window Strike Tips

Treating windows is the most effective solution for preventing window strikes. Window treatments don't have to be expensive! Some low-cost examples include treating with stickers, adhesive decals, dot patterns, tempera paint, external films, and so much more! Another option is replacing windows with bird-safe glass. These bird-safe glass have patterns on them that tell birds "Hey! This isn't an open space to fly in!"

While treating windows is a great way to create a bird-friendly environment, there are many other actions that we can take to help protect the bird population.

- *Lights Out:* By simply extinguishing exterior, and some interior, lighting at night – particularly during migration – you will greatly reduce the possibility that birds will be attracted to your building while in flight. Window transparency and reflectivity can also be mitigated by engaging interior window coverings. See: https://lightsoutheartland.org

- *Landscaping, bird feeders and bird baths:* Birds often try to fly from one tree or fixture to one "seen" reflected in a window. Birds can reach fatal flight speeds when flying from vegetation or feeders and baths located 10-30 feet from a building, while they are unable to reach such speeds when starting from trees and shrubs planted close to buildings. This is why the placement of landscapting and other fixtures is important. Planting native plants can also help the decling bird population by providing shelter and essential food resources, all while supporting biodiversity. Also, avoidiing pesticides and herbicides can create a healthier environment for all wildlife.

- *Window treatments/decals:* Numerous products and artistic possibilities exist for treating problematic windows. Some building owners have chosen to engage artists to create murals on particular windows. Others chose to place patterned tape or "Zen curtains" to disrupt birds' visual perception of a window. Most window treatments are either attractive or almost unnoticeable to the human eye. To be effective, only the most collision-prone windows need to be treated – this is why the BirdSafeKC project records not just the building that a bird hit, but the specific window or column of windows.

- *Keep cats indoors:*Although cats can make great pets, outside cats are one of the leading contributors to population declines. It is their natural instinct to hunt, but by keeping them indoors, you are not only protecting their overall health and life expectancy, but birds as well.

- *Bird-friendly coffee:* If you can't start your morning without your usual cup of Joe, consider switching to bird-friendly or shade-grown coffee. Many coffee producers rely on sun–grown methods, which this process involves clearcutting and deforestation. Meanwhile, shade-grown coffee is cultivated under a multi-layer canopy of trees This promotes biodiversity and provides that crucial habitat for birds. It's also less acidic on our bodies and has a bolder taste than sun-grown coffee.

- *Avoid plastic use:* Plastics are extremely harmful to birds, especially through ingestion and entanglement. Birds mistake plastic debris for food, which can become fatal. The long-lasting nature of plastic in the environment will accumulate over time, polluting habitats and endangering wildlife. Reducing our reliance on single-use plastics, we can help protect our birds and their habitats.

Although it may be daunting, making these changes in our daily lives can make a real difference in protecting birds and their habitats.

References

Banks, RC. Reflective plate glass - a hazard to migrating birds. BioScience 1976; 26(6):414.

Hager S, Cosentino BJ. Surveying for bird carcasses resulting from window collisions: a standardized protocol. PeerJPrePrints 2014; 2:e406v1

Hager SB, Cosentino BJ, McKay KJ, Monson C, Zuurdeeg W, Blevins B. Window area and development drive spatial variation in bird-window collisions in an urban landscape. PLoS ONE 2013; 8(1): e53371.

Horton KG, Nilsson C, Van Doren BM, La Sore FA, Dokter AM, Farnsworth A. Bright lights in the big cities: migratory birds' exposure to artificial light. Frontiers in Ecology and the Environment 2019; 17(4): 209-214.

Klem Jr., D, Farmer CJ, Delacretaz N, Gelb Y, Saenger PG. Architectural and landscape risk factors associated with bird-glass collisions in an urban environment. Wilson Bulletin 2009; 121(1):126-134.

Loss SR, Will T, Loss SS, Marra PP. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. Condor 2014; 116: 8–23.

Loss SR, Will T, Marra PP. Direct mortality of birds from anthropogenic causes. Annual Review of Ecology, Evolution and Systematics 2015; 46: 99–125.

Loss SR, Lao S, Eckles JW, Anderson AW, Blair RB, Turner RJ. Factors influencing bird-building collisions in the downtown area of a major North American city. PloS ONE 2019; 14(11): e0224164.

Parkins KL, Elbin SB, Barnes E. Light, glass, and bird—building collisions in an urban park. Northeast Naturalist 2016; 22: 84–94

Rosenberg KV, Dokter AM, Blancher PJ, Sauer JR, Smith AC, Smith PA, Stanton JC, Panjabi A, Helft L, Parr M, Marra PP. Decline of the North American avifauna. Science 2019; 366(6461): 120-124.

Seewagen CL and Sheppard C. Bird collisions with windows: An annotated bibliography. American Bird Conservancy 2017; https://abcbirds.org/wp-content/uploads/2017/02/Window_Collision_Bibliography-February-2017.pdf

P. O. Box 16
Arrow Rock, Missouri 65320

NONPROFIT
MARKETING MAIL
U.S. POSTAGE PAID
PI 17
MARSHALL MO
65340

Photo: *Among the Giants* by Hal Moran