

SUMMARY REPORT



SEATTLE BIRD COLLISION MONITORING PROJECT

SUMMARY FROM THE 2021 PILOT & 2022 MONITORING SEASONS

Joshua Morris
Urban Conservation Manager
Seattle Audubon
December 2022



GOOD LOOKING

In addition to managing the Seattle Bird Collision Monitoring Project, I also participate in it as a volunteer surveyor. After months of searching sidewalks and not finding anything, I thought I'd be excited when I found a dead bird.

Not so.

It was an Orange-crowned Warbler. It struck a window and fell among some spent azalea blossoms. Even dead, it was beautiful.

Finding its little body first made me sad. Perhaps this bird, weighing only a few ounces, had just arrived from Mexico. Then I felt angry that this amazing creature died because of architectural ignorance, carelessness, or vanity.

Birds deserve better from us.

Seattle Audubon is committed to understanding and preventing bird-window collisions. The issue is understudied in the Seattle area, but thanks to the efforts of volunteer community scientists, we are making strides.



In the last year and a half, hundreds of people have shared online reports of dead birds. Dozens more have joined in collision monitoring, spending more than 300 hours searching for collision victims.

That's some good looking. I'm grateful for the efforts of our community scientists, funders, building partners, colleagues, and others who have helped get this project off the ground. I'm excited to share what we've found so far, and I look forward to learning more so that we may better advocate for cities where people and birds thrive.

A handwritten signature in blue ink, appearing to read 'Joshua Morris'. The signature is fluid and cursive, with a long horizontal line extending to the right.

JOSHUA MORRIS

Urban Conservation Manager

PROJECT BACKGROUND

Between 365 and 988 million birds die each year in the United States due to collisions with glass (Loss et al., 2014). That makes glass one of the worst human-related impacts that directly kills birds. However, most research examining the impacts of collisions has occurred east of the Mississippi, with just a handful of studies from the West Coast.

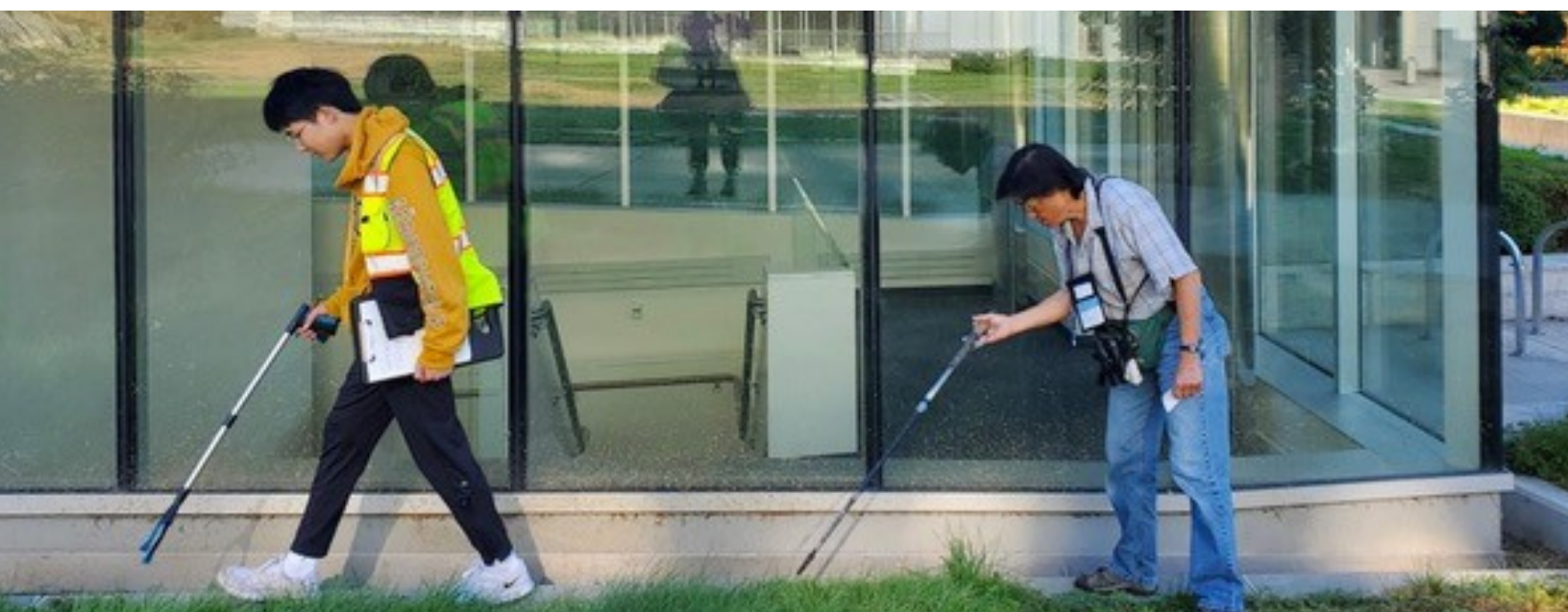
We launched the Seattle Bird Collision Monitoring Project in 2021 as part of our Bird-Safe Cities program. The project seeks to document bird-window collisions in Seattle and to identify factors that contribute to collision risk so that we may prevent them. We follow a protocol adapted from the work of Hagar and Cosentino (2014) and Loss et al. (2016).

During collision monitoring seasons, we conduct daily surveys for dead or injured birds at a set of preselected study buildings. Trained volunteers search an area within six feet of study building walls. We assume any carcasses within this area are window-collision victims unless another source of mortality is apparent.

We encourage volunteers to complete surveys within specific windows of time so that the interval between repeated surveys is approximately 24 hours. However, this is not always possible, and the survey interval is occasionally several hours more or less than 24.

We bag and store any carcasses in Seattle Audubon's freezer, as allowed under our USFWS Migratory Bird Special Purpose Salvage Permit. We eventually donate the carcasses to the Burke Museum or deposit them back into the environment for carcass persistence trials.

The Seattle Bird Collision Monitoring Project is in partnership and shares information with the Evaluating Campus for Bird Building Collisions project led by Judy Bowes, a PhD student at the University of Washington.



STUDY BUILDINGS

We have monitored a total of 16 buildings in the Capitol Hill, First Hill, and University District neighborhoods of Seattle.

Study buildings are a mix of commercial, residential, and institutional structures. We select buildings based on a number of factors, including:

- **Building design features.** The buildings we monitor exhibit a range of high-risk design features, such as extensive areas of reflective glass, transparent corners, or see through conditions. They should also include features that may reduce risk, such as external shades or sun screens. We also consider building type, size, and sustainability certifications such as LEED.
- **Surrounding environment.** We want a variety of different environments around our study buildings. Some should be in close proximity to green, blue, or open space, while others should be in more intensely developed areas. This may help us understand the effects of habitat on collision risk.
- **Practical considerations.** We consider volunteer safety and comfort in study building selection. We also consider the ease with which buildings can be surveyed and try to obtain permission from building managers.

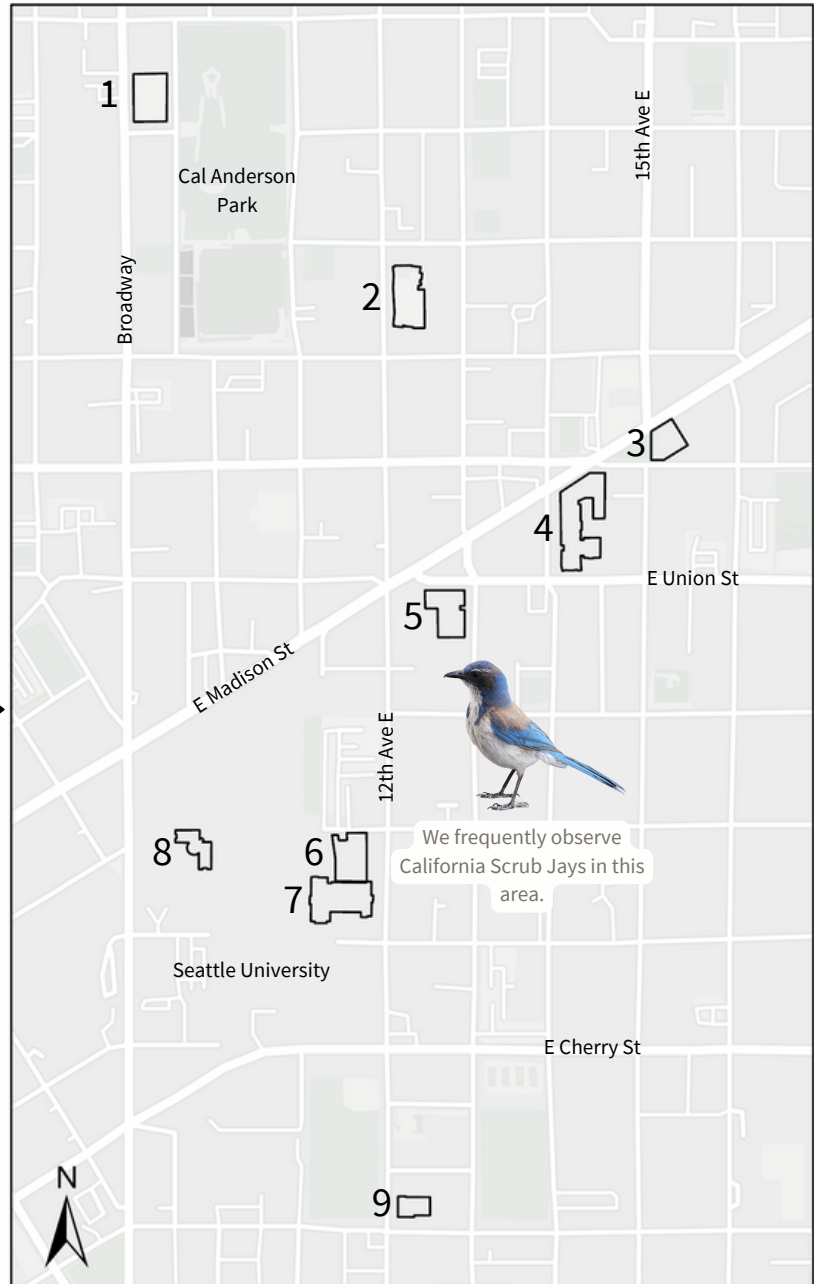
We did not survey every building during each monitoring season. We monitored some only during the pilot season, some only in later seasons.

We also do not survey entire buildings. Sometimes it is not physically possible to survey the entire perimeter of a building, and sometimes we prefer to focus our searches at areas that may pose the greatest risk to birds.

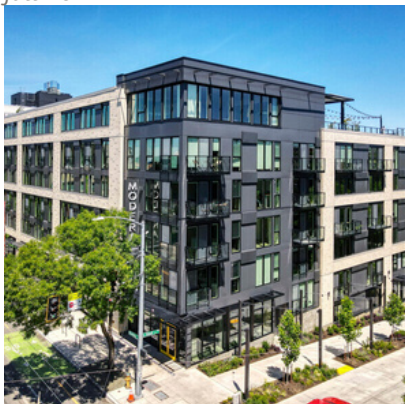


Hazardous see-through conditions and reflections at the Marine Studies Building on the UW campus.

STUDY BUILDINGS CAPITOL HILL & FIRST HILL



1. Modera Broadway
fall 2021



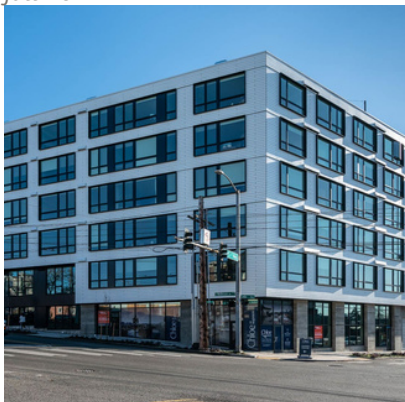
2. 12th Ave Arts
fall 2021



3. Bullitt Center
fall 2021, spring 2022, fall 2022



4. Chloe Apartments
fall 2021



5. Seattle Academy
fall 2021, spring 2022, fall 2022



6. SU Sinegal Center
fall 2022, spring 2022, fall 2022



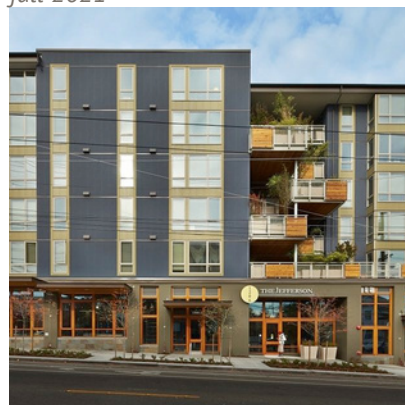
7. SU Law Building
fall 2021



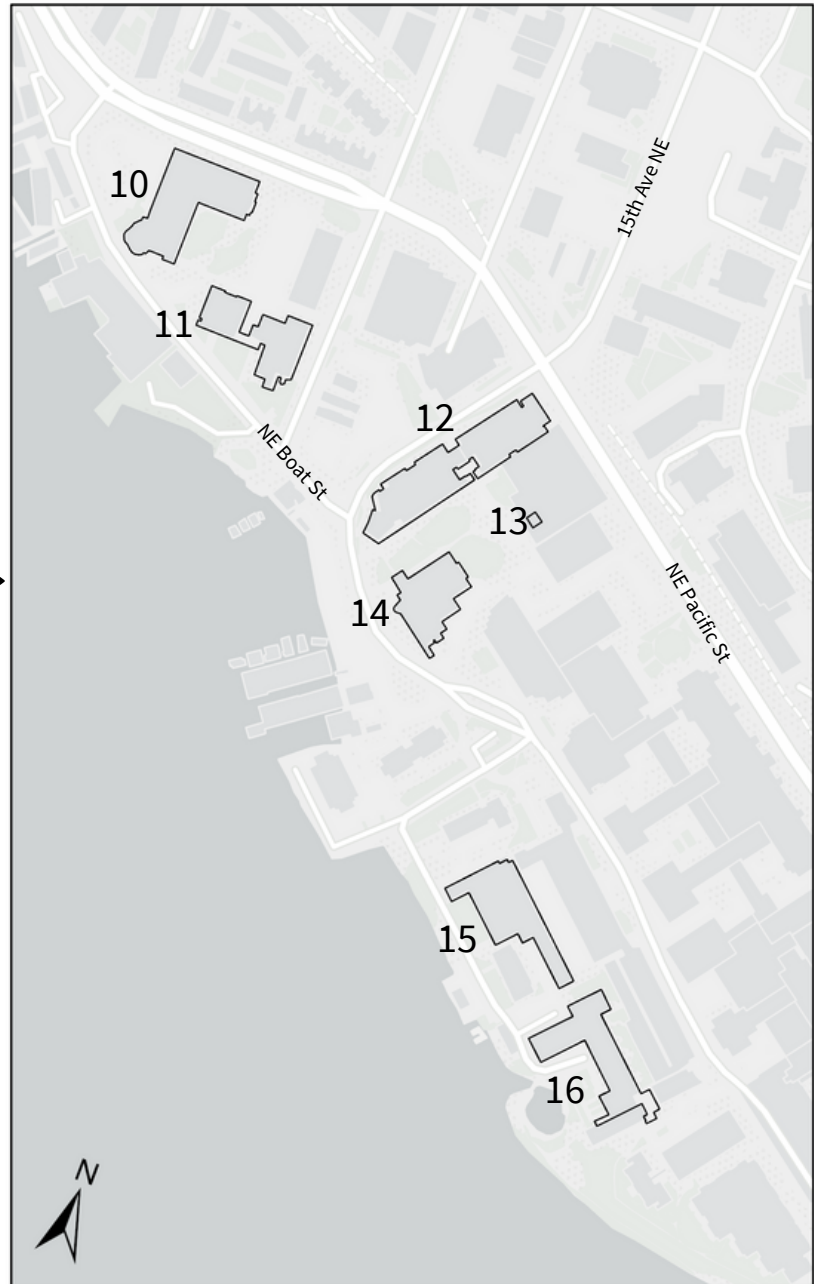
8. SU Casey Atrium
spring 2022, fall 2022



9. The Jefferson Apartments
fall 2021



STUDY BUILDINGS UNIVERSITY OF WASHINGTON



American Crows often watch surveyors along the UW route.



10. Fisheries Science Building
fall 2022



11. Marine Studies Building
fall 2022



12. Foegen Building Skybridge
spring 2022, fall 2022



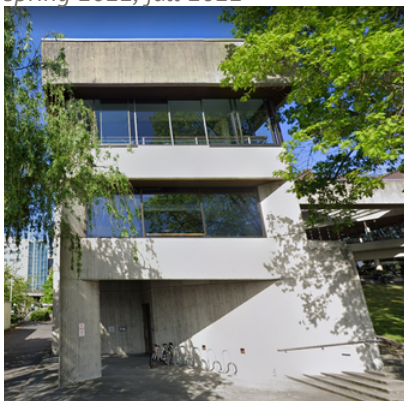
13. Entrance to ARCF
spring 2022, fall 2022



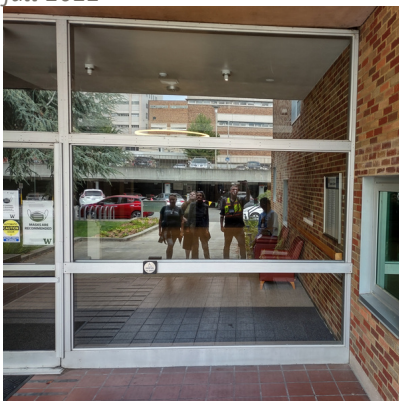
14. Ocean Sciences Building
spring 2022, fall 2022



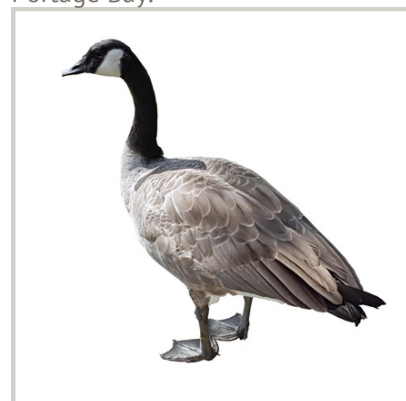
15. South Campus Center
spring 2022, fall 2022



16. Portage Bay Building
fall 2022



Canada Geese are numerous along Portage Bay.



FALL 2021 PILOT SEASON

The fall 2021 pilot season ran for 61 days from September 1 to October 31, 2021.

Twenty-eight volunteers monitored eight buildings every day, for a total search time of more than 140 hours.

Volunteers detected evidence of three window collisions: two unidentified remains and a freshly deceased Swainson's Thrush.

28

volunteer
surveyors



8

study buildings



3

fatal collisions
detected



140+

hours searching
for birds



Detections



A. Window-collision fatality. Unidentified. Seattle U, Law Building. September 4, 2021.

B. Window-collision fatality. Unidentified. Seattle U, Sinegal Center. October 2, 2021.

D. Window-collision fatality. Swainson's Thrush. Seattle U, Sinegal Center. October 30, 2022.

SPRING 2022

The Spring 2022 monitoring season ran for 45 days from April 15 to May 29, 2022.

Twenty-six volunteers monitored eight buildings every day, for a total search time of more than 83 hours.

Volunteers detected three fresh carcasses, all Orange-crowned Warblers, an injured House Finch, and some unidentified remains.

26

volunteer
surveyors



8

study buildings



83+

hours searching
for birds



4

fatal collisions
detected

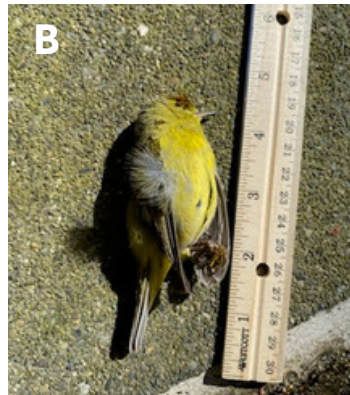


1

collision-related
injury detected



Detections



- A. Window-collision fatality. Unidentified remains. Seattle U, Sinegal Center. April 19, 2022.
 B. Window-collision fatality. Orange-crowned Warbler. Seattle U, Casy Atrium. April 22, 2022.
 C. Window-collision fatality. Orange-crowned Warbler. Seattle U, Casy Atrium. May 4, 2022.
 D. Window-collision injury. House Finch. UW, Foege Building Skybridge. May 10, 2022.
 E. Window-collision fatality. Orange-crowned Warbler. Seattle U, Sinegal Center. May 16, 2022.

FALL 2022

The fall 2022 monitoring season ran for 45 days from September 8 to October 22, 2022.

Twenty-seven volunteers monitored 11 buildings, for a total search time of more than 90 hours.

Volunteers found one unambiguous feather pile and two suspicious arrangements of feathers. We did not find any fresh carcasses.

27

volunteer
surveyors



11

study buildings



1-3

fatal collisions
detected



90+

hours searching
for birds



Detections



- A. Suspected window-collision fatality. Unidentified. UW, Marine Studies. September 23, 2022
- B. Suspected window-collision fatality. Unidentified. UW, Fisheries Science. September 23, 2022
- C. Suspected window-collision fatality. Unidentified. Seattle U, Sinegal Center. October 1, 2022

CARCASS PERSISTENCE

Carcass removal by scavengers and people is a major source of bias in collision monitoring studies. Carcass persistence (CP) trials help quantify that bias.

To date, we have conducted 29 CP trials. In fall 2021, the CP trial period was October 10 to 18 ($n = 15$). In fall 2022, the CP trial period was October 16 to 22 ($n = 14$).

Seventeen of the trial carcasses were from birds previously killed by window collisions. One each died from exhaustion, exposure, cat predation, and vehicle collision. Cause of death is unknown for the remaining ten.

Carcasses ranged from a tiny, 3-gram Rufous Hummingbird to a chunky, 117-gram Steller's Jay. We stored carcasses in a freezer, as allowed under Seattle Audubon's USFWS Salvage Permit.

We placed thawed carcasses on a variety of substrates including concrete, river rock, grass, or other vegetation within 6 feet of study building walls. We informed volunteers of the CP study and location of the trial carcasses.

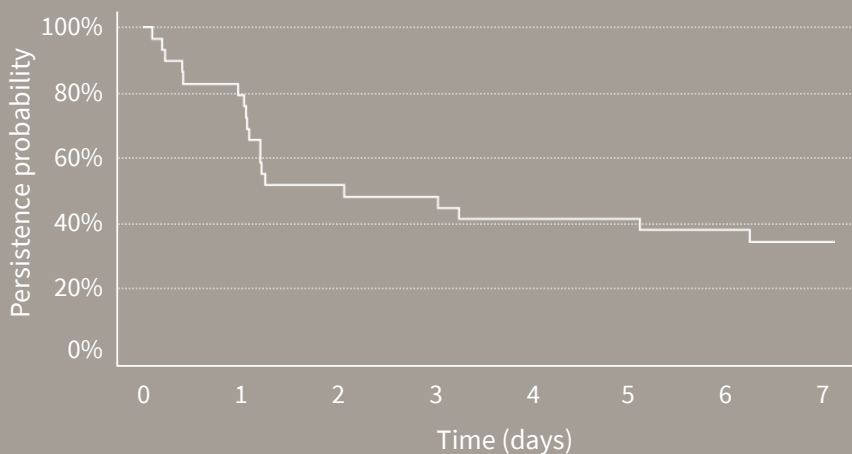
We checked trial carcasses three times per day until carcasses were no longer present or until the end of the study period. Carcass removal time was the interval between placement of a carcass until it was removed and no longer detectable.



A Hermit Thrush trial carcass placed on a ledge adjacent to reflective windows at the Molecular Engineering and Sciences Building, UW campus.

PERSISTENCE PROBABILITY:

The probability that a carcass will be detectable after a given time period since placement. Trial carcass sample size: $n = 29$ Median persistence time: 1.4 days



Day	Persistence probability
1	0.76
3	0.45
7	0.34


SEARCHER EFFICIENCY

Songbirds are the most common victims of window collisions; many of the birds have small body sizes, cryptic plumage, and/or fall in areas that are difficult for people to access. For these reasons, we are unlikely to detect all carcasses that are present around our study buildings.

Like removal due to scavenging, imperfect detection by surveyors is another important source of bias in collision monitoring studies. To account for this, we need to estimate our "searcher efficiency"—the probability that we will detect carcasses when they are present.

We have not run rigorous searcher efficiency trials, but we have asked volunteers to search for and report trial carcasses during carcass persistence studies.

Since volunteers were alerted in advance that trial carcasses would be present, this method will overestimate searcher efficiency. Still, the results are suggestive.

 When trial carcasses are present during carcass persistence studies, volunteers detected them **61%** of the time.



Carcasses are difficult to detect. Can you find the Anna's Hummingbird in the photo above? See back cover for the answer.

OPPORTUNISITIC REPORTS

In addition to structured surveys through the Seattle Bird Collision Monitoring Project, Seattle Audubon also collects reports of dead birds opportunistically through dBird.org, an online platform for reporting and tracking human-related bird mortality and injury.

We launched dBird in the Seattle area in April 2021. Since then, we have received 433 reports of dead and injured birds from at least 61 species. Cause of death/injury is unknown for 295 (68%) of the reports.

Of the 139 reports with known causes of death, 76 (55%) are due to bird-window collisions, representing 31 species (see table 1).

Most collision reports (78%) are of songbird species, including corvids. There are also several reports of hawks, falcons, doves, woodpeckers, and hummingbirds. Varied Thrush and American Robins are the most frequently reported species, 12% and 11% of window collision reports respectively.

We do not fully understand why some species seem to collide with windows more frequently than others. It may be a combination of relative abundance, habitat preferences, diet and foraging behavior, migratory movements, and physiology.



This Varied Thrush collided with a window at Lakeside School in North Seattle. Reported by Yoon Lee and Sophie Biernacki.

TABLE 1: DBIRD COLLISION REPORTS BY SPECIES

Species	# of Reports
American Crow	2
American Goldfinch	1
American Robin	8
Anna's Hummingbird	1
Black-capped Chickadee	1
Cedar Waxwing	1
Chestnut-backed Chickadee	1
Cooper's Hawk	3
Dark-eyed Junco	7
Golden-crowned Kinglet	1
Golden-crowned Sparrow	1
Hawk species	1
Hermit Thrush	1
House Finch	2
MacGillivray's Warbler	1
Merlin	1
Northern Flicker	3
Olive-sided Flycatcher	1
Orange-crowned Warbler	5
Pacific-slope Flycatcher	1
Passerine species	2
Peregrine Falcon	2
Pine Siskin	1
Rock Pigeon	1
Rose-breasted Grosbeak	1
Savannah Sparrow	1
Song Sparrow	2
Spotted Towhee	1
Swainson's Thrush	2
Unknown	5
Varied Thrush	9
Western Tanager	3
White-crowned Sparrow	2
Wilson's Warbler	1

HOW DOES SEATTLE COMPARE?

After more than 300 hours of searching over 151 days, we found evidence of up to 11 bird-window collisions.

Compared to some other studies, this seems low. Table 2 displays our results along with those from collision monitoring research in four other cities. While the studies all differ somewhat in methodology, and direct comparisons aren't possible, it is still interesting to look at the findings side by side. Without controlling for search effort, in Seattle, we found far fewer birds per building per day than other studies. Even during spring 2022, when we found the greatest number of collisions for our project, it was still three times fewer birds per building per day than were found in the NYC study, and 20 times fewer birds per building per day than the Portland study.

Why?

Some possibilities:

- Collisions may not occur at high rates at our study buildings.
- Collisions may not occur at high rates during our study periods.
- Scavenging rates may be higher than suggested by our carcass persistence studies. Some hypothesize that scavengers avoid carcasses that have been previously frozen, as we have used in our studies.
- Searcher efficiency may be much lower than we think. We know that our estimated searcher efficiency is an overestimate. Perhaps it is a gross overestimate.
- We may not be spending as much time searching for carcasses as researchers in other cities.

TABLE 2: FINDINGS ACROSS STUDIES

	Study days	Study buildings	Collision count	Collisions per building per day	Source
Portland, OR	365	1	100	0.274	Helzer, Coolidge & Ujcic-Ashcroft, 2020
San Francisco, CA	1825	1	308	0.169	Kahle, Flannery & Dumbacher, 2016
Vancouver, BC	225	8	152	0.084	De Groot et al., 2021
New York City, NY	45	16	35	0.048	Parkins, Elbin & Barnes, 2015
Seattle, WA (spring 2022)	45	8	5	0.014	Seattle Audubon, 2022
Seattle, WA (fall 2021)	61	8	3	0.006	Seattle Audubon, 2021
Seattle, WA (fall 2022)	45	11	3	0.006	Seattle Audubon, 2022

UP NEXT

Continuing our research

We intend to run the Seattle Bird Collision Monitoring Project through at least 2026. In coming seasons, we will try to monitor at different times of the year, search in more neighborhoods, and include a greater variety of building types.

One of the most common building types in Seattle is detached houses. Detached houses are not often included in collision monitoring studies. However, we suspect that a significant portion of Seattle's bird-window collision mortality occurs at these structures. We are exploring research designs that would allow individuals to conduct structured collision monitoring surveys at their own homes.

We will continue to study carcass persistence and searcher efficiency.

We are also exploring additional methods of understanding bird-window collisions. Following the lead of other researchers, we are developing a survey that will ask participants to recall and describe any collisions they have experienced.

Applying what we learn

We apply what we learn through collision monitoring to reduce the risk of bird-window collisions. For example, where we have discovered collisions on the Seattle University campus, we are in conversation with our building partners to discuss possible solutions.

Advocating for change

We also advocate for change at the city level. We have shared about the Seattle Bird Collision Monitoring Project with members of the City Council and the Mayor's Office. In 2022, Mayor Bruce Harrell proclaimed the first-ever "Bird-Safe Seattle Week," which acknowledged the hazard posed to birds by glass in Seattle's built environment. We will continue working with our elected officials on bird-safe policy for our city.



THANK YOU, VOLUNTEERS

Come wet and cold or hot and smoky, collision monitors brave it all to improve our understanding of bird-window collisions.

Collision monitoring can be challenging, repetitive, and emotional. We recognize and appreciate the contributions of our all our community scientists.

Thank you so much!

Fall 2021

Elizabeth Bacher
 Karissa Bosshart
 Judy Bowes
 Amy Candiotti
 Anders Chen
 Elaine Chuang
 Adrienne Dorf
 Megan Elfman
 Michelle Flowers
 Anne Freudenthal
 Steven Gary
 Allison Heisel
 Michelle Hope
 Maria Kahn
 Yoon Lee
 Olga Levaniouk
 Rachel Lodge
 Barbara Mandula
 Tracey Marsh
 Madison Mayfield
 Joshua Morris
 Jack Pauw
 Jessica Schiffman
 Nancy Schutt
 Andy Seigel
 Hye-In Mary Shim
 Wendy Walker

Spring 2022

Ashley Arthur
 Will Bassett
 Meenakshi Bose
 Judy Bowes
 Natalie Boydston
 Natalee Bozzi
 Elizabeth Cameron
 Amy Candiotti
 Kasper Cergol
 Elaine Chuang
 Anne Freudenthal
 Michelle Hope
 Yoon Lee
 Hye-in Mary shim
 Joshua Morris
 Nefertiti Orimoloye
 Acacia Pottschmidt
 Peggy Printz
 Diana Rosetti
 Jessica Schiffman
 David Schoen
 Lydia Schoen
 Emily Sellinger
 Hollis Shadko
 Andy Siegel
 Maureen Traxler

Fall 2022

Will Bassett
 Meenakshi Bose
 Virginia Bound
 Judy Bowes
 Liam Patrick Bryant
 Amy Candiotti
 Petrina Chan
 Elaine Chuang
 Diana Rosetti
 Joshua Feldon
 Barbara Feldon
 Michelle Hope
 Kat Kelley
 Kate Lanier
 Nora Lee
 Yoon Lee
 Barbara Mandula
 Joshua Morris
 Isabella Newcomer
 Nefertiti Orimoloye
 Abhishek Sen
 Andy Siegel
 Irene Svete
 Maureen Traxler
 Lindsey Vickers
 Hallie Xu

Want to get involved?

Scan the code with your smartphone to check for volunteer opportunities.



THANK YOU, FUNDERS

Our Bird-Safe Cities program, which includes the Seattle Bird Collision Monitoring Project and dBird.org, is made possible by the generous support of:

Jim and Birte Falconer

In 2020 and 2023, the Falconers made landmark gifts to our organization to help understand and prevent bird-window collisions. Thank you, Jim and Birte!



This work is also supported in part by:

Seattle Audubon Annual Fund Donors

Many generous donors contribute to the Annual Fund each year to support our conservation, science, and education programs. Thank you to all who donate! We can't and don't do this work alone!

Make your gift today

We advocate and organize for cities where people and birds thrive.

Scan the code with your smartphone to support urban conservation, community science, and environmental education.



CREDITS & REFERENCES

Image credits

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Page 1 Orange-crowned Warbler. Joshua Morris / Seattle Audubon.

Page 2 Seattle Bird Collision Monitoring Project volunteers at ARCF, UW. Elaine Chuang.

Page 3 Marine Sciences Building. Google Street View.

Page 4 California Scrub Jay. Kate Mueller / Getty Images.

Page 5 Modera Broadway. LoopNet.com.

Page 5 12th Ave Arts. NDC.

Page 5 Bullitt Center. Joe Mabel / Wikipedia.

Page 5 Chloe Apartments. Equity Apartments.

Page 5 Seattle Academy of Arts and Sciences. Joshua Morris / Seattle Audubon.

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Page 5 The Jefferson Apartments. Community Roots Housing.

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Page 7 Marine Studies. Google Street View.

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Page 7 Ocean Sciences Building.

Page 7 South Campus Center. Google Street View.

Page 7 Portage Bay Building. Joshua Morris / Seattle Audubon.

Page 7 Canada Goose. ArtSource / Getty Images.

Page 8 A: Unidentified remains. Jessica Schiffman / Seattle Audubon.

Page 8 B: Unidentified remains. Anne Freudenthal / Seattle Bird Collision Monitoring Project / Seattle Audubon.

Page 8 C: Swainson's Thrush. Anne Freudenthal / Seattle Audubon.

Page 9 A: Unidentified remains. Natalie Boydston / Seattle Audubon.

Page 9 B: Orange-crowned Warbler. Amy Candiotti / Seattle Audubon.

Page 9 C: Orange-crowned Warbler. Joshua Morris / Seattle Audubon.

Page 9 D: House Finch. Jessica Schiffman / Seattle Audubon.

Page 9 E: Orange-crowned Warbler. Anne Freudenthal / Seattle Audubon.

Page 10 A: Unidentified feathers. Joshua Morris / Seattle Audubon.

Page 10 B: Unidentified feathers. Joshua Morris / Seattle Audubon.

Page 10 C: Unidentified feathers. Joshua Morris / Seattle Audubon.

Page 11 Hermit Thrush trial carcass. Joshua Morris / Seattle Audubon.

Page 12 Anna's Hummingbird carcass in vegetation. Joshua Morris / Seattle Audubon.

Page 13 Varied Thrush. Yoon Lee / dBird.org

Page 15 Varied Thrush woodblock design. Angelina Villalobos.

Page 16 Seattle Bird Collision Monitoring Project volunteers. Elaine Chuang.

Page 17 Anna's Hummingbird. colloidal / Getty Images.

References

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Enlarged view of the Anna's Hummingbird carcass from page 12. Rain and time have dulled the sheen on the feathers, making it difficult to spot among the vegetation and woodchips.



www.seattleaudubon.org

