



Monitoring Program Report

2012-2013

The Lights Out Columbus Campaign was initiated by the **Ohio Bird Conservation Initiative** and the **Grange Insurance Audubon Center**.



OHIO BIRD
CONSERVATION
INITIATIVE



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BACKGROUND AND INTRODUCTION

Every spring and fall, millions of birds migrate through Columbus on their way to or from their breeding grounds. Many birds migrate at night, and lights on tall buildings or aimed at the sky can disorient them and draw them into the buildings. This causes many birds to strike windows or circle buildings until they fall from exhaustion. Building collisions are a leading cause of bird fatality during migration in North America, and it is estimated that between 365 and 988 million birds are killed annually by flying into buildings and windows (Loss et al. 2014). Lights Out programs provide an opportunity to reduce the number of collision-related kills, and have been successful in a number of cities across the U.S., including Chicago, New York, Indianapolis, and Minneapolis. The Lights Out Chicago program reports an 80% reduction in building collisions following a reduction in nighttime light emissions (David Willard, The Field Museum, personal communication, February 22, 2012).

Lights Out Columbus, which began in August 2012, is a campaign to educate building owners, managers, and residents about the risks of nighttime lighting and window strikes to migrating birds and motivate them to reduce these risks while also decreasing their energy expenditures. We work with these individuals to adapt the current lighting scheme at their building to reduce dangers to nocturnally migrating birds, while maintaining the building's safety standards and aesthetic beauty.

From March 2012 to October 2013, the Lights Out Columbus Monitoring Program has collected data on nighttime light emissions and bird collisions during peak bird migration periods (March-June and August-October) for the Uptown and Arena Districts of Columbus, Ohio. These surveys provided baseline data on nighttime light emissions, and also help target enrollment efforts for Lights Out Columbus.

Initial findings from the 2012 Lights Out Columbus Monitoring Program showed a significant relationship between the number of dead or injured birds found at a building and the nighttime light index of the building. This report incorporates additional data collected during 2013 to present the final findings of the Lights Out Columbus Monitoring Program.



This brown creeper died as a result of a collision with a building in downtown Columbus.



Exterior lighting on buildings like this is a hazard for nocturnally migrating birds.

METHODS

BIRD COLLISION SURVEYS

Twenty buildings (10 at least 50m tall and 10 less than 50m tall) were randomly chosen within the Uptown and Arena Districts of Columbus, Ohio using ArcMAP. Buildings were surveyed to 1-4 times weekly starting at sunrise from 15 March to 1 June and from 15 August to 31 October, 2012-13. The start and end times of the surveys and the number of volunteers searching were recorded. During the survey, observers searched the entire perimeter of each randomly selected building. All injured or dead birds seen while searching at selected buildings or while walking between buildings were recorded and dead birds were collected.



Lights Out Columbus volunteers find a bird on the sidewalk in downtown Columbus that has died after colliding with a window.

Distance from survey building, and building side where bird was found were also recorded. When a bird was found, the date, building ID or address, and species of the bird



were recorded. Each individual was then photographed with size reference and ID number, and the species identification was confirmed by an expert. All birds were donated to Ohio State Museum of Biological Diversity under the Museum's USFWS Migratory Bird Salvage Permit.

Photograph with size reference taken of a Blackburnian warbler found by Lights Out volunteers. The specimen was then bagged with ID tag and delivered to the OSU Museum of Biological Diversity.

NIGHTTIME LIGHT SURVEYS

Surveys for nighttime lighting were conducted at least once weekly from 15 March to 1 June, and biweekly from 15 August to 31 October. To measure lighting, a picture was taken of each of the 20 randomly selected buildings. In spring, surveys started at least 1 hour after sunset. In fall 2012 and Spring 2013, surveys began after the Lights Out Columbus recommended start time of 11 pm. Pictures were taken of the side of the building facing the street. For buildings with multiple sides facing the street, a random direction was chosen. For each subsequent visit, the same side was photographed. Additionally, as birds can become “trapped” inside beams of upward facing light and circle inside the beams until they drop to the ground from exhaustion, the number of upward facing lights for the side of the building was counted.

Building photos were analyzed using the program *AnalyzingDigitalImages* (Museum of Science 2008). The percentage of illumination was calculated for each building by counting the number of pixels in each building photo contained within illuminated parts of the building, and dividing by the total number of pixels contained within the building face in the photo (Figure 1).

In Spring 2012, illumination percentages for each building were averaged according to weekday or weekend survey and compared using a Student’s T-test to determine if light levels differed between weekday and weekend surveys.

For all years, linear regression was used to examine the relationship between illumination percentage and the number of floors in the building. Following the methods of Evans Ogden (2002), a light index was calculated for each building by multiplying the building’s average illumination percentage by the number of floors in the building. Linear regression was used to examine the relationship between the number of dead birds found at a building and the building’s light index and number of upward facing lights.



Figure 1. An example of the use of the program *AnalyzingDigitalImages* to calculate the illuminated percentage of a building. The original survey photo (left) is masked to show only pixels within lit areas of the building (right).

RESULTS

BIRD COLLISION SURVEYS



A Lights Out Columbus volunteer examines the map of the study route during a bird collision survey.

Spring 2012: Between March 15 and June 1, 2012, 33 morning surveys for bird collisions were conducted by trained volunteers along the survey route in downtown Columbus. Trained volunteers collected 30 birds of 14 species during morning surveys. An additional 39 birds of 19 species were found by Capital Crossroads Special Improvement District employees and other volunteers in downtown Columbus. A total of 70 birds of 23 species were collected from within downtown Columbus during the study period (see Appendix for a list of species found).

Fall 2012: Between August 15 and October 31, 2012, 21 morning surveys for bird collisions were conducted by trained volunteers along the survey route in downtown Columbus. Trained volunteers collected 37 birds of at least 16 species during morning surveys. An additional 42 birds of 22 species were found by Capital Crossroads Special Improvement District employees and other

volunteers in downtown Columbus. A total of 110 birds of 27 species were collected from within downtown Columbus during the study period.

Spring 2013: Between March 15 and June 1, 2013, 27 morning surveys for bird collisions were conducted by trained volunteers along the survey route in downtown Columbus. Trained volunteers collected 47 birds during morning surveys. An additional 11 birds were found by Capital Crossroads Special Improvement District employees in downtown Columbus. A total of 58 birds of 24 species were collected from within downtown Columbus during the study period.

Fall 2013: Between August 15 and October 31, 2013, 15 morning surveys for bird collisions were conducted by trained volunteers along the survey route in downtown Columbus. Trained volunteers collected 21 birds of at least 18 species during morning surveys. An additional 16 birds were found by Capital Crossroads Special Improvement District employees in downtown Columbus. A total of 37 birds of 18 species were collected from within downtown Columbus during the study period.

NIGHTTIME LIGHT SURVEYS

Spring 2012: Volunteers conducted 13 nighttime surveys for lights at the 20 randomly selected buildings on the survey route. Average illumination percentages calculated for buildings ranged from 0 to 10.86% with a mean of 4.87%. The average illumination percentage for buildings was significantly different on weekdays and weekends ($t = 2.16$, $df = 19$, $p = 0.043$), with the average illumination percentage higher on weekdays than on weekends. There was not a significant relationship between illumination percentage and the number of floors in the building.

Light indices calculated for surveyed buildings ranged from 0 to 3.63 with a mean of 0.95 (Table 2). The number of birds found at a building was positively correlated with the building's average light index ($R^2 = 0.27$, $t(19) = 2.59$, $p = 0.019$). There was not a significant relationship between the number of birds found at a building and the number of upward facing lights at the building.

Fall 2012: Volunteers conducted 6 nighttime surveys for lights at the 20 randomly selected buildings on the survey route. Average illumination percentages calculated for buildings ranged from 0 to 4.55% with a mean of 1.93%. Again, there was not a significant relationship between illumination percentage and the number of floors in the building.

Light indices calculated for surveyed buildings ranged from 0 to 1.46 with a mean of 0.36. The number of birds found at a building was positively correlated with the building's average light index ($R^2 = 0.55$, $t(19) = 4.73$, $p = 0.000$).

Spring 2013: Volunteers conducted 9 nighttime surveys for lights at the 20 randomly selected buildings on the survey route. Average illumination percentages calculated for buildings ranged from 1.32% to 16.7% with a mean of 4.5%.

Light indices calculated for surveyed buildings ranged from 0.03 to 4.37 with a mean of 0.92. The number of birds found at a building was positively correlated with the building's average light index ($R^2 = 0.72$, $t(19) = 2.61$, $p = 0.000$).

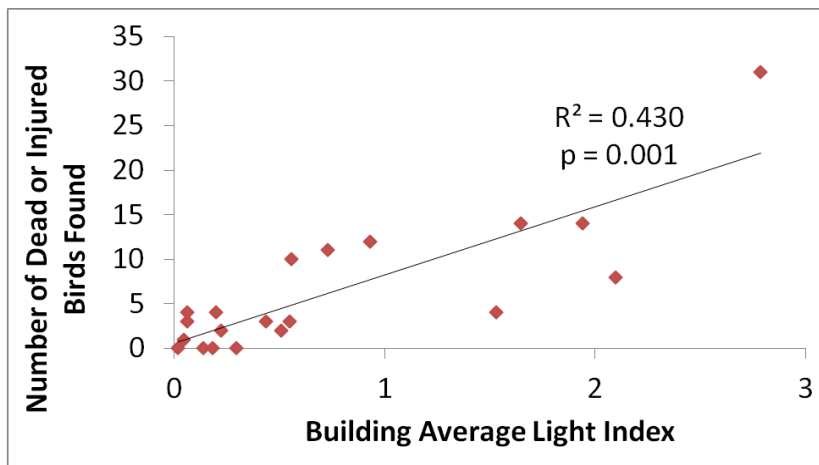


Figure 2. Linear regression of number of dead birds found at a building and the building's average light index. Data collected during daytime surveys for collisions and nighttime surveys for building lights of 20 randomly selected buildings in Columbus, OH from March 15–June 1 and August 15–October 31, 2012-13.

CONCLUSIONS



An indigo bunting killed by a collision with a building in downtown Columbus.

Our study found a significant relationship between the number of dead or injured birds found at a building and the nighttime light index of the building. This relationship indicates greater numbers of dead or injured birds are found at buildings that are both taller and brighter.

Our findings align with the results of a study conducted by the Fatal Light Awareness Program in Toronto, which found an increasing number of fatal bird collisions with increasing light index (Evans Ogden 2002). Light index was calculated using the same technique as in this study,

incorporating building height. Evans Ogden also found the number of fatal bird collisions at a building was not simply a function of building height.

The results of the Lights Out Columbus monitoring program have important implications for the conservation of Ohio's migratory birds. Our finding that increasing light index leads to more dead or injured birds supports the need for a Lights Out program in Columbus to guide building owners, managers, and residents in reducing nighttime lighting. In addition to reducing energy usage and associated costs, our data show that efforts to reduce nighttime lighting on buildings could reduce the number of migratory birds killed by building collisions in Columbus.

FINDING SOLUTIONS TO COLLISIONS: LIGHTS OUT COLUMBUS

Lights Out Columbus combines elements of public outreach, conservation, and research in a campaign to learn more about the dangers of nighttime lighting for migrating birds while educating building owners, managers, and the public about how to reduce building collisions. As a coalition of almost 100 organizations that support bird

conservation efforts in Ohio, OBCI was uniquely suited to implement this type of partnership project. With the support of more than 10 local and regional partners, OBCI and the Grange Insurance Audubon Center (GIAC) established Lights Out Columbus in August 2012.

OBCI's Program Coordinator and the GIAC Conservation Manager work with the owners and managers of the 19 buildings currently enrolled in Lights Out Columbus to adapt each building's lighting scheme to reduce dangers to nocturnally migrating birds while maintaining safety standards and aesthetic beauty. Building on the success of Lights Out Columbus and with the support of National Audubon Society's Toyota TogetherGreen program, OBCI is working with



partners across the state to start a statewide Ohio Lights Out program in 2014. To learn more, please visit OhioLightsOut.org.

LITERATURE CITED

AnalyzingDigitalImages, Version 11. Museum of Science, Boston, MA, 2007–2008.

Evans Ogden, L.J.. 2002. Summary Report on the Bird Friendly Building Program: Effect of Light Reduction on Collision of Migratory Birds. Special Report for the Fatal Light Awareness Program (FLAP). 30 pp.

Loss, Scott R., Tom Will, Sara S. Loss, and Peter P. Marra. 2014. Bird–building collisions in the United States: Estimates of annual mortality and species vulnerability. *The Condor: Ornithological Applications* 116:8–23.

APPENDIX

Species and numbers of individuals of dead or injured birds found during Lights Out Columbus monitoring program collision surveys and by other volunteers in downtown Columbus, OH from March 15–June 1 and August 15–October 31, 2012–2013.

| Total Bird Species | Number of Individuals |
|-----------------------------|------------------------------|
| Ovenbird | 31 |
| White-throated Sparrow | 18 |
| Yellow-bellied Sapsucker | 12 |
| House Sparrow | 13 |
| Tennessee Warbler | 12 |
| Gray Catbird | 8 |
| Rock Pigeon | 8 |
| Indigo Bunting | 7 |
| Red-breasted Nuthatch | 7 |
| American Woodcock | 5 |
| Black and White Warbler | 8 |
| Yellow-billed Cuckoo | 5 |
| Brown Creeper | 4 |
| Ruby-throated Hummingbird | 6 |
| Wood Thrush | 4 |
| American Robin | 4 |
| Common Yellowthroat | 4 |
| Lincoln Sparrow | 3 |
| Nashville Warbler | 3 |
| Northern Flicker | 4 |
| American Redstart | 2 |
| Bay-breasted Warbler | 3 |
| Black-throated Blue Warbler | 3 |
| Connecticut Warbler | 2 |
| European Starling | 2 |
| Magnolia Warbler | 4 |
| Mourning Dove | 3 |
| Northern Parula | 2 |
| Swainson's Thrush | 2 |
| Yellow Warbler | 2 |
| American Goldfinch | 3 |
| Baltimore Oriole | 1 |
| Blackburnian Warbler | 1 |
| Blue Jay | 1 |
| Brown Thrasher | 1 |
| Chestnut-sided Warbler | 1 |

| | |
|--------------------------|------------|
| Chimney Swift | 1 |
| Field Sparrow | 1 |
| Golden-crowned Kinglet | 1 |
| Gray-cheeked Thrush | 1 |
| Hermit Thrush | 2 |
| House Finch | 1 |
| Kentucky Warbler | 1 |
| Northern Waterthrush | 1 |
| Rose-breasted Grosbeak | 1 |
| Song Sparrow | 1 |
| carolina chickadee | 1 |
| carolina wren | 1 |
| <i>unknown</i> | 30 |
| <hr/> | |
| Total Individuals | 242 |
| Total Species | 49 |