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## NORTHERN PARULA

(Parula warbler; *Setophaga [Parula] americana*)



**Northern parulas were among the most common victims of migratory bird collisions first noted at City Hall Tower at the start of the twentieth century.**

*Figure 7.1* Northern parula, a nocturnal migrant I found dead on the sidewalk at 23rd and Walnut Streets on October 4, 2010, after a storm the night before.

In 1916 the Delaware Valley Ornithological Club published a report by club member Delos E. Culver:

ABOUT 10 AM, May 22d, 1915, there was received, at the Academy of Natural Sciences, Philadelphia, a call from the "Evening Bulletin" of that city for aid in the identification of a small "yellow and green" bird which had been picked up in the court yard of the City Hall. From this it was learned that hundreds of birds were lying about on the ledges surrounding the Public Buildings and City Hall Tower. Immediately upon receiving this information, I, accompanied by a "Bulletin" photographer, hurried to the scene, and the mortality, when ascertained, was really appalling.

Upon reaching the courtyard, the areaways were first examined. Looking down into them, we found that although very few dead specimens were visible (most having been gathered by employees), there were many living birds continually flying up and down the full length of the areaways, apparently having lost all sense of direction. Maryland Yellow-throats were in evidence everywhere. Every areaway was full of fluttering birds of this species, and it was among them that the greatest mortality occurred. Upon entering the areaways from below, the following species were identified: Maryland Yellow-throat, Parula Warbler, Redstart, Red-eyed Vireo, Chewink, Long-billed Marsh Wren, Water-Thrush, Black-throated Blue, and Black-poll Warblers. Of the Vireo, Chewink and Wren but single specimens were observed. The former was caught alive and later liberated in the country, making little or no effort to escape when approached. The Wren was the most active of the three, while the Chewink, apparently hungry, was continually picking at dirt particles and other minute objects in search of something to eat.

After making the above notes, we proceeded to the roofs for further examinations, and here the conditions proved even more pitiful than those below. Dead birds lay everywhere, while others, seemingly bewildered, flitted about on the ledges of the building, apparently too weak to resume their weary journey, or, as before stated, had lost all sense of direction. If such was not the case, the birds were certainly on the point of exhaustion, otherwise one cannot conceive anything to prevent them from resuming their northward journey from these upper ledges, high above the city, its noise and confusion.

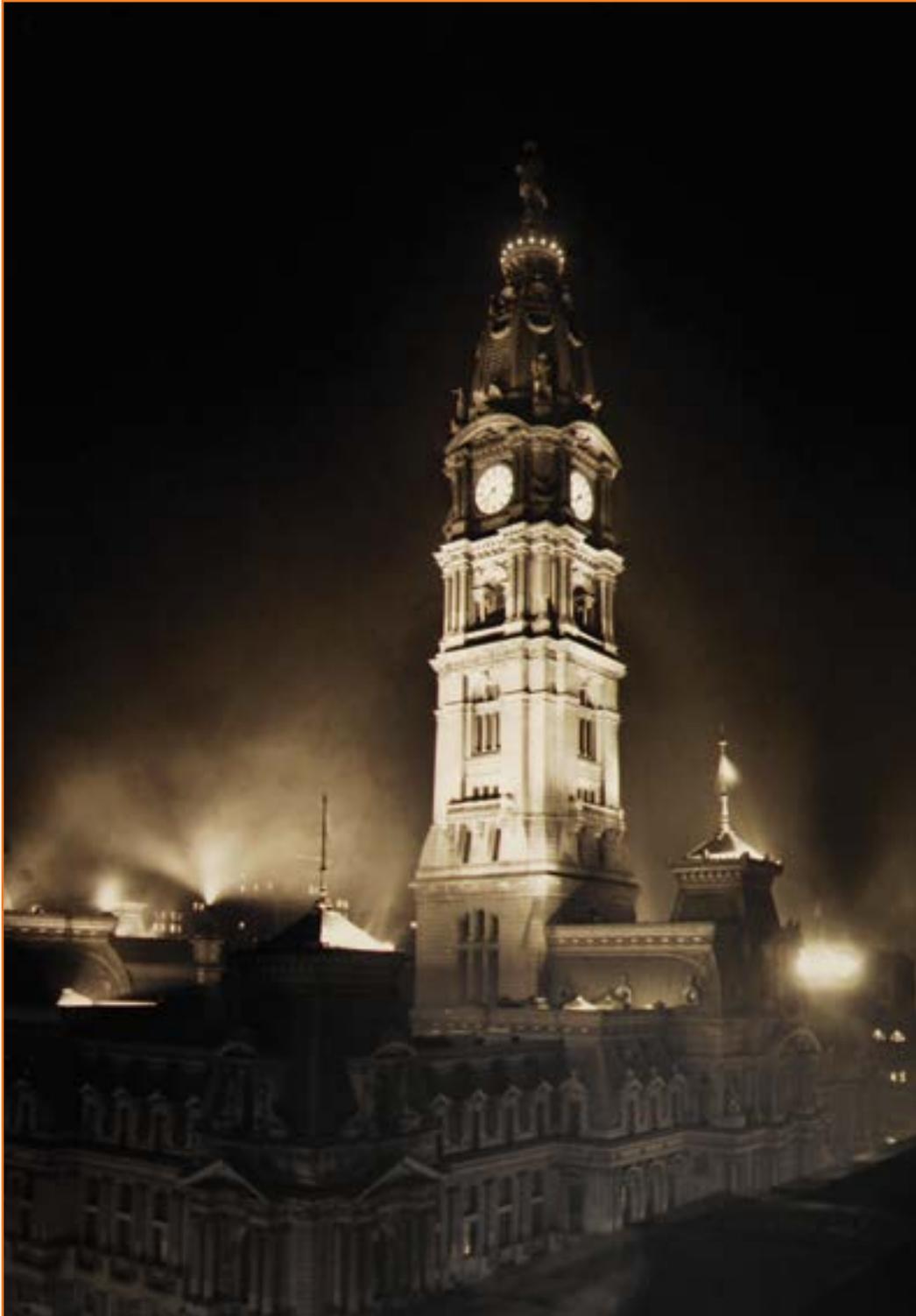
The birds in the areaways acted in the same way. When we entered from below they immediately flew to the top and alighted on the surrounding railings; but when we withdrew, the birds, instead of flying up to the roof and continuing their journey, immediately flew back down into the pits, which were sooner or later to be their tombs, apparently frightened by the crowds and continuous bustle. Most of these birds seemed very much exhausted, but were quite able to fly continually back and forth the full length of the areaways.

Although many of the birds became exhausted from continuous fluttering about the lights and later succumbed to exposure, the greater number of the hundreds of lives lost were caused by coming in contact with hard structures, as the fractured limbs, bruised bodies, indented and blood-clotted skulls proved, when examinations were made after skinning the specimens...

And now let us consider some of the most interesting points in the case; i.e. the cause of such an appalling destruction. Following an unusual cool period of weather for the month of May, on the 21st considerable moderation took place, and about 10 p.m. rain began falling. Prior to the rain quite a heavy mist hung about the city, but was later cleared away by the falling rain. By midnight and in the early morning hours the rain had turned to a thunderstorm with a terrific downpour, which continued well into the morning.

As before stated the greater number of birds were killed by striking hard structures, and it is the writer's opinion that the birds, being forced to migrate low on account of the storm, were attracted by the bright lights, and apparently misconceiving them to be suspended in midair, attempted to fly past just above or below the center of illumination, and therefore struck the darker portions of the tower, which were unilluminated.

We must however bear in mind that this was but one immediate locality, and when we consider the number of towers, and equally as tall buildings through the city, we realize that the loss of life must have been tremendous, and can certainly not help but have a noticeable effect upon bird-life.<sup>1</sup>



*Figure 7.2* City Hall Tower, with its “corona” of arc lamps near the top, 1917. On the evening of May 21, 1915, hundreds of migrating birds, including northern parulas, died in collisions with the tower. (Photo courtesy of PhillyHistory.org, a project of the Department of Records of the City of Philadelphia)

The dead “yellow and green” bird that prompted the phone call to the Academy in May was probably a warbler, perhaps the northern parula. A century earlier Alexander Wilson reported that the northern parula arrives in Pennsylvania from the south in May.<sup>2</sup>

## The clock in City Hall Tower

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In December 1898 the City of Philadelphia had installed a gigantic illuminated clock in City Hall Tower, then the world’s tallest occupied building. The tower rose 167 meters above the street, and on each of its four sides it supported an illuminated dial 8 meters in diameter. Each minute hand was almost 5 meters long, including the counterweight, and weighed over 100 kilograms. The clock with all its parts weighed 50 tons. A hydraulic air compressor powered it, and 512 electric lamps, each with an output of 16 candlepower, illuminated the dials.<sup>3</sup>

To broadcast the time to the surrounding suburbs, the clock controlled a “corona” of arc lamps shining outward from the base of the statue of William Penn, the highest point of the tower. They were visible “twenty-five or thirty miles from the city, appearing like a delicate silver crescent suspended low against the horizon.”<sup>4</sup> Every night the clock would turn the arc lamps off ten minutes before 9 p.m. and back on precisely at 9 p.m. *The Official Handbook of City Hall* instructed suburbanites on how to process the signals:

Look towards the City Hall a few minutes before nine o’clock P.M. until the circle of light at the top of the tower disappears; then, when it reappears, set your watch or clock at the hour NINE, and, presto, you have secured correct time.<sup>5</sup>

Dead birds were first observed at City Hall Tower in 1899. William L. Baily, one of the founders of the Delaware Valley Ornithological Club, reported the phenomenon at a meeting of the American Ornithologist’s Union in Philadelphia that year:

In the centre of the city of Philadelphia, five hundred feet and more above the pavement, on top of the City Hall Tower, stands the colossal bronze figure of William Penn, encircled with a ring of arc lights which burn the night long. Unintentionally this beautiful circle, crowning the highest point for miles around, has been the destroyer of many birds during their nocturnal migrations between their winter and summer homes.<sup>6</sup>

Baily reported the dead birds collected from around the tower in 1899 consisted of 56 species and 452 individuals, including 67 northern parulas.<sup>7</sup> During the first decade of the twentieth century, *Cassinia*, the journal of the Delaware Valley Ornithological Club, published an annual tally of birds killed at City Hall Tower.

## Lighthouses in the Gulf of Mexico

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In 1904 Wells W. Cooke was able to pinpoint fall migration times based on deaths of migrant birds at powerful electric lights in the Gulf of Mexico.

The largest single addition to the knowledge of movements of birds along the southern border of the United States is due to records of species striking the lighthouses off the south coast of Florida. Several thousands of these instances have been recorded. They furnish the best available data so far collected on the length of the migrating season, and afford also much-needed information concerning the time when many species of birds begin their migration in the fall. The keeper of the lighthouse at Sombrero Key, in particular, has taken

much interest in the matter, and has spent many hours counting and identifying birds, either killed by flying against the glass protecting the light or resting bewildered on the balcony after striking. Eight hundred and sixteen records were received in five years from this one lighthouse. They comprise a total of 2,011 dead birds and 10,086 birds which struck the light with so little force that on the return of clear skies or daylight they were able to resume their flight. Warblers migrate chiefly by night and are so susceptible to the influence of a bright light that they constitute at least 80 percent of these thousands.<sup>8</sup>

Among warblers, the northern parula was the second most common to strike the lighthouse:

The earliest fall movements of the parula warbler on land cannot be noted, for the migrants are not distinguishable from the breeding birds. When, however, the species begins to strike against the lighthouses of southern Florida, it is certainly migrating. It passes through Florida in countless thousands, being second only to the black-throated blue warbler in the frequency with which it strikes the lighthouses. Out of eighty-eight recorded dates of the striking of parulas in fall only eight are earlier than the second week in September.<sup>9</sup>

## Disruption of visual cues used in navigation

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The abundance of warblers (including northern parulas) migrating at night accounts at least in part for the large number of these birds colliding with City Hall Tower and Cooke's lighthouses. To navigate at night, warblers integrate many cues, including the pattern of stars in the sky, polarization of skylight, landmarks, and the earth's magnetic field.<sup>10</sup> Clouds and fog increase the risk of collisions with buildings, presumably by obscuring visual cues. Electric lighting at night exposes migrants' navigational systems to visual artifacts, compounding disorientation caused by overcast skies. Laboratory experiments and field trials suggest that artificial light disturbs magnetoreception, and that the least disruptive wavelengths lie in the green spectral region.<sup>11</sup>

## Glass facades and windows

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Eight skyscrapers, all constructed since 1987, now dwarf City Hall, which is dimly lit, its arc lamps long gone. The Comcast Center is taller than City Hall by 130 meters—greater than the length of a football field. The shortest of Philadelphia's top twenty tallest buildings is 23 meters higher than City Hall's big clock.<sup>12</sup> Illuminated windows highlight the sides of these buildings at night, and ornamental lighting decorates their tops and sometimes their facades. On overcast nights, when nocturnal migrant birds are most vulnerable to collisions with buildings, the upper stories disappear in a shroud of fog.



*Figure 7.3* Comcast Center's glass façade blending in with the sky. One thousand birds per year have been estimated to die striking this and adjacent buildings.

The reflective blue-tinted glass of new skyscrapers compounds the danger their lights and height pose to migrating birds. Over the past two decades, Daniel Klem of Muhlenberg College in Allentown, Pennsylvania, has studied bird fatalities caused by collisions with glass. He has concluded that window glass kills more birds than does any other human disturbance except destruction of habitat,<sup>13</sup> and that the primary reason for collisions with glass is the failure of birds in flight to recognize clear or reflective glass as a barrier.<sup>14</sup>

The lethality of glass may appear obvious at ground level, where homeowners who have placed bird feeders near windows witness birds striking windowpanes.<sup>15</sup> On skyscrapers high above street level, the dangers are harder to observe. Klem and colleagues, collaborating with New York City Audubon, trained thirty volunteers to recover dead or injured birds from the base of seventy-three buildings in Manhattan during two migration periods. They recovered 549 birds—82 percent of which were dead—that included at least fifty species. The proportion of a facade that was glass correlated with the number of birds recovered from its base. Klem et al. concluded that glass, ranging from small windows to entire walls of buildings, is a lethal hazard for birds. Among the ten most common victims in this study were northern parulas.<sup>16</sup>

A study of birds killed striking buildings in Toronto compared the frequency of collisions to the proportion of windows that were illuminated at night. Based on recovery of 1,300 dead and injured birds from sixteen buildings, the investigators concluded that window lighting contributed to bird collisions.<sup>17</sup> A practical question is whether turning off lights in buildings at night reduces bird strikes at windows. Ornithologists at the Field Museum in Chicago had been acquiring new specimens by collecting dead birds at a large lakefront convention center called McCormick Place. To cut costs when the exhibition hall was not booked, the building manager began turning off the lights—and the number of dead birds per year plummeted by 80 percent.<sup>18</sup>



*Figure 7.4* Illuminated facade of Cira Centre viewed across the Schuylkill River from Center City. The color and pattern of the ornamental lighting changes from one night to the next.

Removal of the arc lamps from the tower of Philadelphia's City Hall did not stop birds from colliding with other buildings in the city. In 2011, students monitoring bird kills on the campus of Temple University recovered 1,200 dead birds including thirty-one species, mostly around Paley Library, the student center, and Tyler School of Art.<sup>19</sup> Keith Russell from the National Audubon Society has monitored dead birds around the base of the Comcast Center. He has estimated that 1,000 birds per year fatally strike windows of buildings in this location.<sup>20</sup>



*Figure 7.5* Temple University's Howard Gittis Student Center, with windows that reflect images of street trees, promoting collisions by birds. In 2011, 1,200 birds including thirty-one species were recovered around Temple's campus buildings, including this building.

## Unilluminated structures

Even in the absence of windows and brightly illuminated facades, tall structures are a danger to birds migrating at night. Millions of birds have died striking power lines, guy wires, communication towers, and wind turbines.<sup>21</sup> Communication towers alone are estimated to kill 6.8 million birds per year.<sup>22</sup>

## Artificial light aimed skyward

Artificial light can kill birds independent of collisions. In a single night in October 1954, an estimated 50,000 dead birds representing fifty-three species, including northern parulas, were strewn over the runways, taxi strips, and other surfaces of the Warner Robins Air Force Base in Macon, Georgia. They had flown or dropped downward in response to a ceilometer, a beam of light aimed up from the ground to measure height of cloud cover.<sup>23</sup> The birds may have circled around the light until they fell from exhaustion or disorientation.<sup>24</sup>

## Polarized light reflected off buildings and pavement

Polarized light reflected off glass buildings on riverbanks attracts caddis flies (Trichoptera), which normally use polarized light reflected off water for navigation; glass, like water, polarizes light it reflects.<sup>25</sup> Bridges reflecting polarized light have disrupted flights of mayflies (Ephemeroptera), which normally breed in water.<sup>26</sup> Solar panels reflecting polarized light have attracted insects from three orders (Diptera, Trichoptera, and Ephemeroptera).<sup>27</sup> Roads reflecting polarized light have induced mayflies to lay eggs on asphalt,<sup>28</sup> and cars reflecting polarized light have attracted dragonflies, which laid eggs on their hoods.<sup>29</sup> Birds detect polarized light, which may explain why water birds at night become stranded on artificially illuminated asphalt parking lots.<sup>30</sup>

Birds and insects navigating downtown confront a cityscape filled with potentially disorienting visual artifacts. How they negotiate this visual noise is poorly understood. Dead birds and insects around buildings and lights demonstrate that visual noise can be lethal.

## Impact of collisions on populations of the northern parula

The northern parula overwinters from the southern United States to Venezuela and Nicaragua. Records of this species colliding with towers and other man-made structures have been reported in Wisconsin, Missouri, Illinois, New York, Pennsylvania, Tennessee, and Florida.<sup>31</sup>

The species breeds in widely scattered locations throughout Pennsylvania, but not in Philadelphia,<sup>32</sup> where it stops to rest during its migratory journeys.<sup>33</sup> Breeding populations of northern parulas have recently been increasing in Pennsylvania,<sup>34</sup> but they have decreased or disappeared in southern New Hampshire, Massachusetts, Connecticut, Rhode Island, New Jersey, and Delaware.<sup>35</sup> Fatal collisions with man-made structures like City Hall Tower might have selectively killed northern parulas whose migration flyways exposed them to the densely urbanized Northeast corridor.

Many other conditions have been cited to explain declines in populations of neotropical migrants like the northern parula. Destruction of forests has reduced habitat in their northern breeding grounds or southern overwintering sites or both.<sup>36</sup> Acid rain has suppressed lichens (*Usnea sp.*) that northern parulas use for building nests.<sup>37</sup> Fragmentation of forests has stimulated growth in populations of cowbirds, which are nest parasites of neotropical migrants.<sup>38</sup> Declines in flying insects have reduced food supplies of neotropical migrants.<sup>39</sup> In Europe, global warming has desynchronized long-distance migrants from their insect prey, which now emerge earlier in the spring.<sup>40</sup>

None of these ecological problems is mutually exclusive, and together they reveal migrants' complex vulnerabilities, which defy easy analysis.<sup>41</sup> For example, some northern parulas build nests without lichens,<sup>42</sup> and compared to most other neotropical migrants, they are infrequent victims of nest parasitism by cowbirds.<sup>43</sup>

## Controversy over effects of collisions on populations of birds

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Collisions with buildings and communication towers have caused no measurable decline in bird populations, according to a recent statistical analysis of records of 240,000 collision fatalities involving more than 188 species; the analysis also included population records from the Breeding Bird Survey. The investigators collected data from records from New York, Chicago, and Toronto, plus records of collisions with communication towers outside of metropolitan areas. They pointed out that many of the species of birds killed are abundant and have high reproductive potential—sufficient to compensate for losses sustained in collisions with buildings.<sup>44</sup>

Partly in response to this paper, Scott R. Loss, at the Smithsonian Migratory Bird Center, and his colleagues have contended that data on causes of mortality of birds are currently insufficient for determining how any particular cause affects populations.<sup>45</sup>

## Protective accommodations at city light show

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During the peak of the fall migration over Philadelphia in 2012, the city hosted an outdoor light show at night on the Benjamin Franklin Parkway. Designed by Mexican-Canadian media artist Rafael Lozano-Hemmer, it included twenty-four moving searchlights aimed upward, somewhat reminiscent of the ceilometer that killed tens of thousands of birds in Georgia over half a century ago.

Alerted to the danger, Lozano-Hemmer collaborated with ornithologists to avoid injuring migrating birds. Bird watchers monitored the night sky for birds congregating around the light beams, which could be turned off in response. Blackout periods were programmed into the show to provide recovery time for the birds. The spotlights were kept in motion to avoid simulating the stationary behavior of lethal ceilometers. Beams were pointed away from buildings at risk of bird strikes. Filters reduced output of energy in the red and ultraviolet wavelengths within the light beams.<sup>46</sup> Watching the light show, I saw no birds concentrating around the lights.

## Biophilia

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On the morning of October 4, 2010, after a storm the night before, I found a dead warbler on the sidewalk along Walnut Street near 23rd Street. I submitted it to the Academy of Natural Sciences, which accessioned such specimens. Nathan Rice, ornithological curator at the Academy, identified the warbler as a northern parula. The death of this iridescent yellow and green nocturnal migrant struck me as sorrowful. The most compelling reason for concern about lethal collisions of birds with buildings in downtown Philadelphia may be biophilia, the human bond with other species.<sup>47</sup>