

# AUTUMN 2004 VISIBLE NIGHT MIGRATION OF BIRDS AT THE EMPIRE STATE BUILDING, NEW YORK CITY, NEW YORK

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Hawk Mountain Sanctuary



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Enclosed is our report: **Autumn 2004 Visual Night Migration of Birds at the Empire State Building, New York City, New York.** This research is the culmination of a year-long study of birds observed in migration at night from the Observation Deck of the Empire State Building. Provided herein are the details and analyses of the migration studied from mid-August through mid-November 2004. Our Spring 2004 report about the night migration in that season is also available in electronic form and free upon request.

This Autumn 2004 report is divided into two sections. For Part I, information is drawn primarily from our scientific papers submitted for publication. Observations about the autumn 2004 night migration are provided, and recommendations made for how best to insure a safe flight for night migrating birds in New York City in future years. Part II includes several historical articles from the New York Times, the Linnaean Society News-Letter and Audubon Magazine about the effect of the Empire State Building (ESB) in past years upon night migrating birds. Also presented are newspaper accounts that outline agreements between the ESB and National Audubon from 1955-1970 to insure a safer passage for birds while also maintaining the distinctive look of Manhattan at night. These partnerships and agreements were established because on the foggy night of 11 September 1948, approximately 750 birds were killed when they collided with the ESB after midnight. Since then several fine, creative ideas have been adopted to provide a safer flight for night migrating birds in New York City.

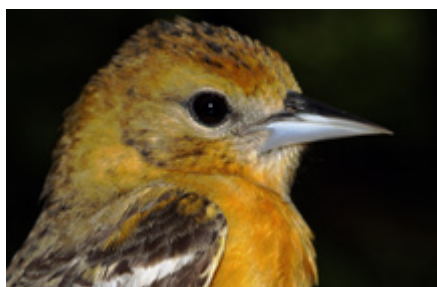
For our research at the ESB in 2004, we have the highest praise for ESB management, electricians and engineers, and security personnel. One individual in particular, Ms. Lydia Ruth, deserves special mention for working behind the scenes to insure safer flight conditions at the ESB for night migrating birds. Similarly, the Security Staff made our time on the Observation Deck easier and pleasant each evening. The ESB has been a model for how scientists and those in the private sector can work together quickly and efficiently to achieve shared goals.

When I became interested in observing the night migration of birds from the Empire State Building, I did so as a conservation biologist. As a biologist in pursuit of facts, it was important to determine the approximate number of birds that could be counted passing by the highest observation point in Manhattan at night, and whether big flight nights were correlated with certain weather and wind patterns. How high do most migrants fly? Could certain types of birds be identified by their flight style? During what hours do most migrants pass over NYC? Do Peregrine Falcons regularly hunt migrating birds at night as they do in other cities? What kinds of raptors might be seen in migration? By collecting and analyzing such nocturnal bird migration information (which had never been attempted before in the history of the ESB), it might also be possible to provide baseline data for comparison if someone wished to do a similar study in the future.

As someone who likes birds and people, the on-site conservation education about why birds are fun to watch/study, why birds migrate at night, and what could be seen from the ESB in migration, was just as important as the data collected. Science and education are part of one endeavor. In this research and in this report, an issue is addressed that is a major concern to everyone who cares about birds: what effect do the night lights of the ESB have on migrating birds in autumn? Are birds being killed in significant number by colliding with the ESB between dusk and midnight? Do birds collide every night with the ESB, or is this a rare event? The

Empire State Building is an icon, perhaps the most recognizable skyscraper in the world. It is hoped that the findings of this study, and the strategies outlined to insure a safer flight for all migrating birds, might have relevance to those who care about migrating birds in cities such as Chicago, Los Angeles, Toronto, and even urban areas as far away as Bangkok, Beijing, Kuala Lumpur and Tokyo.

When I began this research, I was very concerned that many injured and/or dead birds would be found. However, results from this study show a very low mortality rate: during the Autumn 2004 research, more than 10,000 birds were counted migrating past the ESB from mid-August through mid-November, mostly on nights with clear skies and northerly winds. During these three months, four dead birds were found on the Observation Deck that had collided with the building; I was told about another three birds that were found dead at street level. It is sad that even these few birds died. On the other hand, I was surprised that more than 99.9% of the birds seen in migration successfully flew past the building. Scientists looking at radar images of the migration estimate that up to 100,000 birds pass over the northeast on busy nights in September and October. Based upon our observation of spring and fall bird migration in 2004, we believe that the Empire State Building is not a significant hazard to migrating birds. Nevertheless, we make several recommendations to ESB management and anyone concerned about the effect of night lights upon migrating birds that could make the ESB even safer. Indeed, we all can do some small things to make life better for migrating birds. We can work to minimize habitat loss in our parks, and make plate glass windows at ground level obvious to, and safe for, birds. At home, turn off the lights and conserve electricity. Every time we turn on the lights, forests have to be opened to allow natural gas pipelines to go through; trees have to be clear cut to establish strip mines to extract coal; oil has to be extracted, transported, etc. When we keep lights off, we need less gas, coal, and oil. We slow down loss of habitat, thereby protecting nesting birds, insects, plants...not to mention stopping birds from being attracted to lights during migration.



Baltimore Oriole



Gray Catbird

I feel exceedingly lucky to have carried out this research at the ESB. The view from 1,050 feet up was as nice to experience as any view, anywhere. Watching birds pass by like small, shooting stars against the backdrop of the glowing lights of the Manhattan skyline was exhilarating. New York City is home, and it is always nice to see it from a different angle. From a broader perspective, why even bother to study the urban environment? Wouldn't it be better to study birds in some remote, wild place? The answer to these questions is clear: with each passing day, the rest of the world becomes more like New York City. In North America and Europe, most people already live in a city. By the year 2025, it is estimated that two-thirds of the

world's people will live in urban areas. We are not creating more forests, grasslands and coral reefs on the earth. Inevitably, migratory animals such as birds, insects (Monarch Butterflies), and even mammals (bats) will cross paths with humans and cities as they head south in autumn, and then north again in spring. It is important to understand some of the positive and negative effects that cities have upon migratory animals. Also, many of the world's national parks are becoming habitat islands as land around them is developed. Understanding the effects of rapid urbanization might help conservationists develop plans for what species to monitor closely in these more remote areas in the coming years. Finally, how we strike a balance between development for people and the needs of wild things will determine the future of the latter and the quality of life for many of the former. Cities and people, like them or not, are here to stay. The sooner we have an understanding of the effects of urban areas upon wild things, the sooner we can design education and conservation programs to make life better for all concerned. By studying night migrating birds at the ESB, we are doing what we can as urban ecologists to protect birds as they move through our region and over our homes.

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New York City  
December-January 2004-05



Magnolia Warbler

## Results and Recommendations – Autumn 2004

1. On nights with clear skies and winds greater than 15 mph, migratory birds flew past the ESB rapidly and safely.

2. On nights with > 80% overcast skies and winds less than 15 mph, up to 400 birds might circle the ESB. (See #6 below.)

3. Migratory birds (in this study and in historical reports) rarely collide with the ESB before midnight. Large-scale collisions seem to occur after midnight, and probably near dawn.

4. Peregrine Falcons frequently hunted migrating birds at night during autumn but not spring migration in 2004.

5. We saw Ospreys migrating past the ESB at night on two occasions. Ospreys had not previously been known to migrate at night over land. We also saw two species of owls in migration (Saw-whet and Short-eared). We believe that in autumn a few Peregrine Falcons migrate south at night over New York City as well.

6. Our primary recommendation to the management of the ESB is that by 10pm on foggy nights from 15 July until 1 November, the interior lights that illuminate the Tower be turned off along with all non-FAA required lights. The halogen spotlights that illuminate the upper 30 floors or so of the ESB should also be turned off as early as possible on foggy evenings. On overcast nights with light winds (< 15 mph), the practice of turning off the lights at midnight is appropriate and should be continued, especially from early August through early November.

**Note:** beginning in August 2004, lights were turned off at exactly midnight from the upper floors of the ESB as well as the interior lights of the Tower. Only a small ring of lights around the upper part of the Tower and some lights inside the Gift Shop located on the Observation Deck remained on after midnight.

7. In autumn 2005, New York City Audubon could sponsor a major press conference in the lobby of the ESB during the peak season of migration to call attention to the importance of New York City for migrating birds. At the press event, an award could be given to ESB building management personnel, citing their ongoing efforts to make New York City's sky safer at night for birds. At the press event, New York City Audubon should announce its willingness to work with the management of any building to make that building safe for migrating birds.

8. The ESB and New York City Audubon could jointly sponsor a study to determine what effect (if any) the ESB has on migrating birds after midnight. It is unknown whether the small ring of lights around the upper portion of the Tower and the few lights inside the Gift Shop that remained on after midnight affected migrating birds in 2004.

9. We are losing the most critical habitat of all: the classroom. Very few New York City schools teach local environmental awareness as part of their biology curriculum. And very few teachers have sufficient experience and knowledge about the urban environment to feel comfortable enough to take their students out into the field. Here in mid-town Manhattan, the Empire State Building provides an exceptional opportunity to study bird migration in a spectacular setting. Organizations and schools should take advantage of this, and the ESB would enhance its public image by accommodating them.

10. Peregrine Falcons will likely attempt to nest on the ESB in 2005. We recommend that a nest box be installed for them by the New York State Department of Environmental Conservation (DEC), as has been successfully done at other buildings in Manhattan. Also, a camera should be installed in the nest box, along with a monitor in the lobby for people to watch the nesting falcons of the ESB. This type of arrangement has been extremely popular at other buildings in NYC, and would generate much positive publicity for all concerned.

## The Author Wishes to Thank...

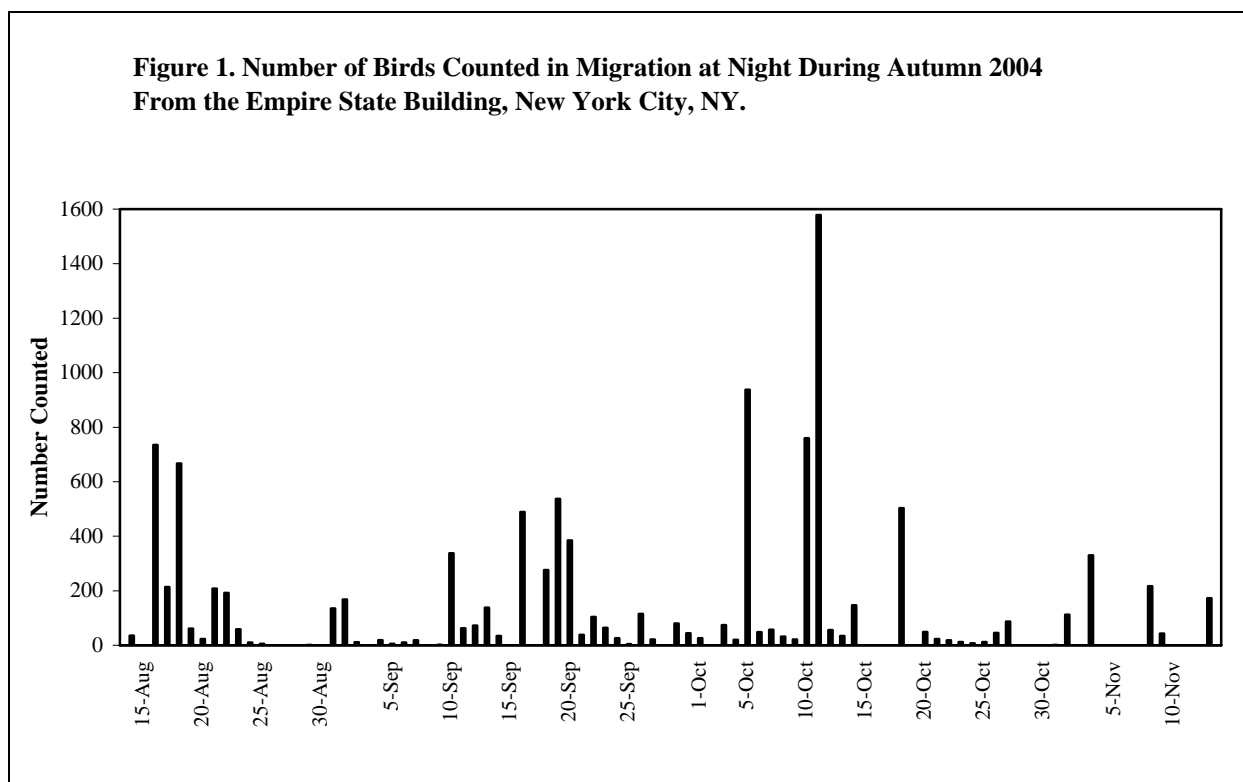
Much of what was observed this year at the ESB at night was seen in the company of people who contributed their time helping to count migrating birds. I want to especially thank the ESB building staff and Security Personnel, and the many, many interested tourists from faraway lands that we met at the ESB every evening in autumn 2004. Several New York City Environmental Organizations also helped with this research: the National Audubon Society, New York City Audubon, The Nature Conservancy, and the Wildlife Conservation Society. Thanks is also due to the following people who made our nights brighter and the experience a special one: Tom Ahlf and Mickey Berger; Deborah Allen; Hatsumi Asaka; Alice Barner; Caryl and Steve Baron; James Barron; Trudy Battaly; Andrew Bernick; Rob Bierregaard, Jr. PhD; Elise Irving Boerger; Tom Burke; Irving and Jean Cantor; Rich Cech and Emily Peyton; Bill Clark; Jason Conrardt and Jennifer Uscher; Nancy Clum, PhD; Alessandra Critelli; Judy and John Day; Ed Drewitt; Eric Edler; Patricia Essler and Stephen Klein; Tomiko Goldman and her new granddaughter; Wayne and Else Greenstone; Merrill Higgins; Carl and Cindy Howard; Evan Janovic; Elaine Kaufmann; Paul Kerlinger, PhD; Dan Klem Jr., PhD; Mark Kolakowski and Rose Klimovich; Andrea Kust and Stephen Shapiro; Dorothy Lourdou; Deslie Lawrence; J. Arthur LeMoine; Barbara Loucks (NYS-DEC); Alan Margolies, PhD; Mark Martell, PhD; Leonard Miller; Christopher Nadareski (NYC-DEP); Chezna Newman; Susan Nobel; Drew Panko; Dr. Richard Rabkin; Tazmeen Rajwani; Karen Rubenstein; Jorge Santiago; Randy Schutz and his daughter, Giancarla Schutz; Chad Seewagen; Ellen Shapiro; Christine Sheppard, PhD; Ed Simon; Howard and Anita Stillman; Philip Sugar; Junko Suzuki; Mary Traynor; Denise Trezza; Angela Turner-Perez; Elvis Wagner; Audry Weintrob; Carol Wood; and Brad (Ouzel) Woodward. Chad Seewagen and Eric Slayton of the Wildlife Conservation Society's New York Bird Monitoring Program kindly granted permission to photograph birds along the Bronx River during their magnificent banding study of migrant birds in our area. Scott Jackson Wiley edited the manuscript and provided greatly appreciated encouragement at key times.



Black-throated Blue Warbler

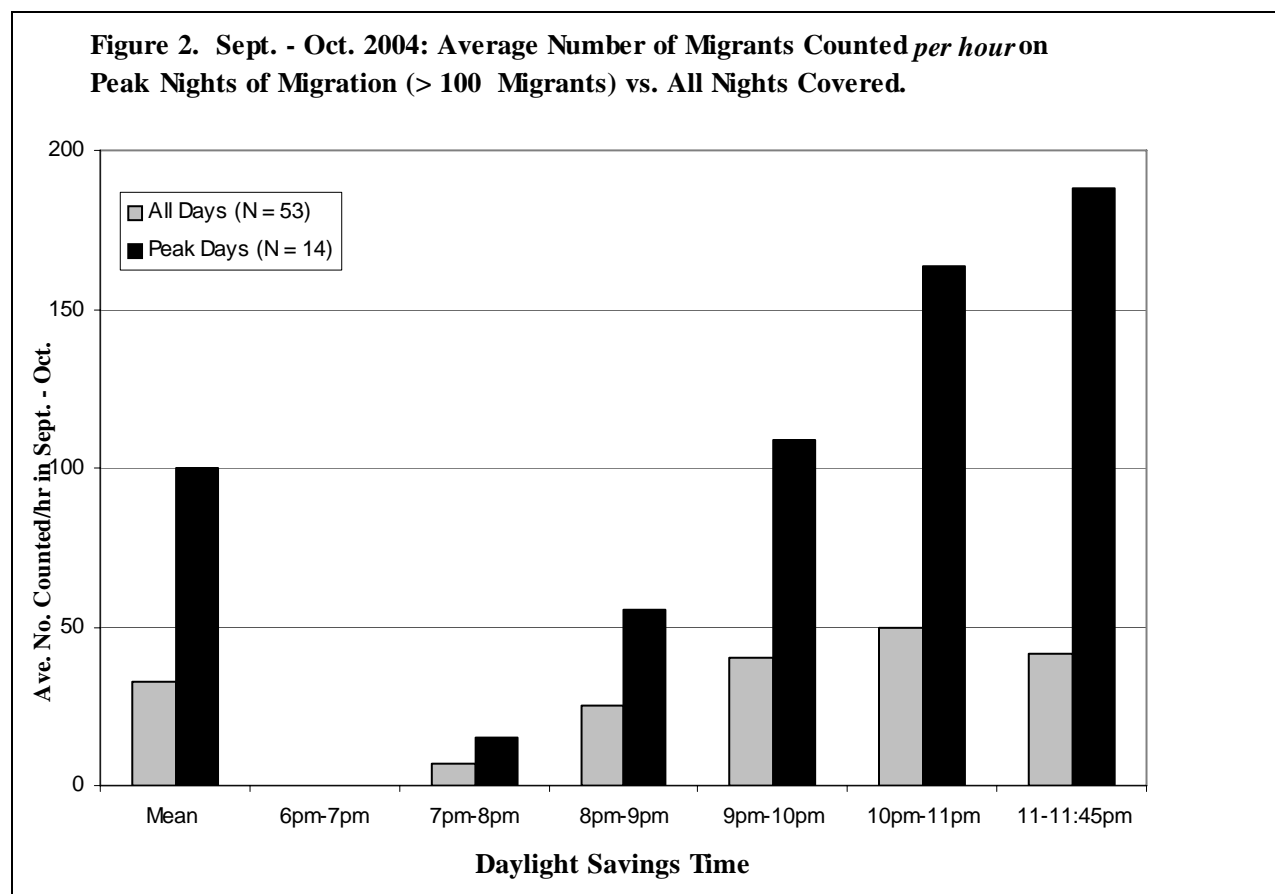
## Autumn 2004 Migration Summary

On 77 evenings from 14 August through 13 November 2004, we counted a total of 10,826 migrating birds (excluding waterfowl, herons and gulls) from the northwest corner of the Observation Deck (elevation 1050 feet/320 meters) of the Empire State Building (ESB). As we did in our spring 2004 survey, we monitored the migration from just before dusk till 11:45pm on most nights, weather permitting. On average, we saw 29.3 migrants per hour in the three months of coverage. According to Figure 1, the peak migration time frame was from 5 October to 11 October when 3,871 migrants (excluding waterfowl) were counted, averaging 113.9 birds/hr. The peak night of migration was 11 October when 1,578 migrants and 288 waterfowl were observed from 7:03pm till 11:45pm (Daylight Savings Time). The peak hour of migration also occurred on 11 Oct. from 10-11pm (DST) when 442 birds (exclusive of waterfowl) were counted. Each evening, the first migrating bird usually arrived approximately 72 minutes after sunset. However, on 24 nights from August to November when more than 100 migrants were counted, the first migrant was seen on average only 56 minutes past sunset.



According to Figure 2 (p.7), in September and October 2004 we noticed a different pattern of migration on peak nights (> 100 migrants counted) than when we pooled the data for all nights in these two months. On 14 peak nights during Sept.-Oct., our data suggest the bulk of the migration passed over Manhattan after midnight. By comparison, a different pattern emerges if we examine data from all evenings in Sept-Oct. in which some migration was observed: the migration seems to peak before midnight. Throughout the autumn, significantly more migrants were seen when winds were from the Northwest to Northeast, than when winds were from other directions. On a few evenings, however, large numbers of migrants were observed when winds

were from other directions. For example, on 18 August, 667 migrants were counted on south-southwest winds that averaged 15 mph.



On several nights “circling behavior” was observed: birds slowly going round and round the Observation Deck and Tower of the ESB primarily in a counter-clockwise direction. (The best place to observe this behavior is actually from street level on the east side of 5<sup>th</sup> Avenue between 31<sup>st</sup> Street and 36<sup>th</sup> Streets, looking up at the ESB Tower.) Overcast nights with light winds seem to induce this behavior. The number of birds “circling” the ESB on these evenings increased through the night. It seems as though on some overcast nights, birds migrating through the area are drawn to the ESB, not only by the light of the building, but by the flight calls of the circling birds. The birds do not make a perfect circle around the upper part of the ESB, but trace more of an oval, often leaving the lighted area to go out into the dark, then returning to the lit area again. Birds seem aware of their precise location in space near the ESB: we never saw one crash into the building on these nights. The maximum number circling occurred on two evenings between 11-11:45pm: 16 August (400 estimated) and 18 October (300 estimated). The sky on these two nights was overcast (80-100% cloud cover), with variable to southwest winds that were < 10 mph. Smaller numbers of migrants were observed circling the ESB on nine other evenings: 14 August (30 estimated); 17 Aug. (80); 21 Aug. (20); 22 Aug. (18); 11 September (4); 14 Sept. (6); 16 Sept. (70); 20 Sept. (75); 5 Oct. (5). On these nine nights, winds were primarily < 8 mph, with clear to 100% overcast skies. What happens to circling birds once most lights from the ESB are turned out at midnight is unknown.

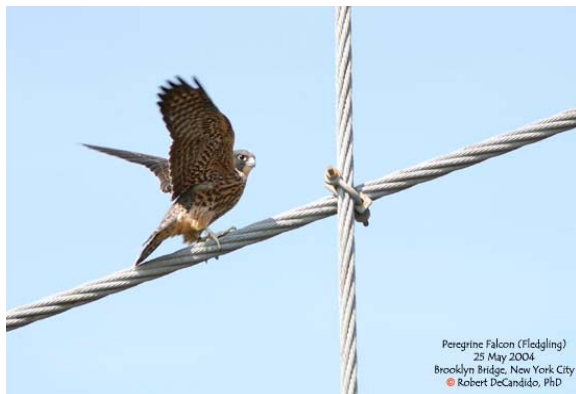
No migrating birds were observed striking the Observation Deck or the Tower of the ESB during autumn 2004, though the light from within the Gift Shop occasionally attracted migrants to the plate glass windows after 10pm. On 19 October after an evening of heavy rain, four birds were found dead on the Observation Deck of the ESB, and another three were picked up from the street on the north side of the building. These represent the only bird fatalities that we were aware of in autumn 2004. Certain species of birds were more attracted to the lights of the building than others. On three evenings (1 October; 3 Oct.; 7 Oct.) Yellow-bellied Sapsuckers landed on the metal support adjacent to the illuminated Tower of the ESB. Here they remained perched for up to 90 minutes before resuming migration. During the months of September and October, a few smaller passerines occasionally landed for less than 10 minutes on the railing adjacent to the illuminated tower. On 18 October, an Eastern Phoebe used the railing above the Observation Deck as a perch from which to fly out and catch insects for almost 10 minutes. Waterfowl, raptors, herons, gulls and several other species were not attracted to the lights of the ESB at any time in 2004.

Compared to the night migration we studied in Spring 2004, the autumn migration of passerines in our area involved many more birds over a longer course of time. In spring, we counted 3,415 migrants with > 90% observed in a three week period from 27 April through 18 May. For autumn 2004, Figure 1 shows at least three distinct peaks of migration: mid-August, mid-September and early to mid-October. Our diurnal observations in Central Park confirm this protracted fall migration pattern: by early July, individuals of several warbler species (Worm-eating, Parula, Blackburnian) can be found in the park, and new arrivals are still discovered in December. Compared to the Spring 2004 migration at the ESB, in autumn 2004 there were more migrants that were, on average, lower in altitude as they flew passed us. One reason why we saw more birds at eye-level or below us in fall than in spring was because the cooler, northerly wind that prevails on autumn migration nights is composed of heavier air that keeps migrating birds somewhat lower in the atmosphere. In spring, migrants generally were higher as they rode north on warm, lighter air masses coming up from the south. Perhaps the most important information for birdwatchers is that good migration nights at the ESB in autumn are often (but not always) associated with good bird watching in Central Park the following day.

## Peregrine Falcons

We observed Peregrine Falcons (*Falco peregrinus*) at the Empire State Building on 41 of 77 evenings of coverage, roughly 53% of the nights we spent at the ESB. We saw our first Peregrine on the evening of 4 August and the last one on 9 November. At least three (an adult male and female, as well as an immature male) regularly used the ESB as a perch to hunt from during our study. Peregrines were much more likely to visit the ESB on nights when 50 or more passerines were counted in migration than nights when fewer total migrants were tallied. On 25 evenings we saw Peregrines chase prey, making a total of 111 hunting attempts and capturing 37 birds (33% success rate). The peak of Peregrine activity occurred from 26 September through 14 October 2004. During this time, Peregrine Falcons were present 16 of 17 nights, and hunted prey on 11 of those nights (70 total hunts with 21 prey captures, or 29.6% success rate). On these nights, the first migrant birds were seen on average 65 minutes after sunset; Peregrines arrived about 91 minutes after sunset and made their first hunting attempt approximately 45 minutes later. By comparison, in Spring 2004, we observed Peregrines on only two evenings and

did not see them make a single hunting attempt. Some of our observations about a particularly exciting evening of Peregrine hunting activity (10 October 2004) are provided in Part II of this report (see page 23).



Fledgling Peregrine Falcon at the Brooklyn Bridge (Spring 2004)



Asian Peregrine (Adult) by Laurence Poh (Malaysia/2001)

In order to determine how frequently Peregrine Falcons hunt resident and migrating birds at night in other parts of the world, we began communicating via email with ornithologists in Europe and Asia. We learned that Peregrines frequently hunt night migrants in a few small cities in England and France, and larger urban areas in Germany (Berlin) and Poland (Warsaw), as well as Hong Kong in the Far East. In North America, Peregrines have been observed hunting migrating birds at night from oil refinery platforms in the Gulf of Mexico. Our observations in 2004 are the most extensive nocturnal ones made; they suggest that for a significant part of the year in New York City, some Peregrines spend more hours hunting at night than during the day. How frequently all other Peregrine Falcons in New York City hunt birds at night is unknown. We may determine this soon, as observers are devoting more of their time to watching live pictures from 24-hour cameras trained upon Peregrine nests, such as at 55 Water Street in lower Manhattan. Christopher Nadaseski, a biologist for the Department of Environmental Protection (NYC-DEP), who bands all the Peregrine Falcon chicks in our city, tells us that he has found bird prey in nest sites that could have only been captured at night, such as the Woodcock (*Scolopax minor*). For our part, we have submitted a scientific paper for publication that describes the nocturnal behavior of Peregrines at the ESB: **Nocturnal Hunting by Peregrine Falcons in Autumn 2004 at the Empire State Building, New York City**. It will appear in The Wilson Bulletin in 2006. We will make electronic copies available once our paper is in print.

During our research we met Ms. Patricia Ballner, an attorney who works in the ESB. She told us about a raptor that may have tried to nest outside her window on the ESB. Through the efforts of Ms. Lydia Ruth, photos of the bird were obtained and emailed to Barbara Loucks of the Endangered Species Unit of the New York State Department of Environmental Conservation. Ms. Loucks confirmed that the species in question was a Peregrine Falcon. We are cautiously optimistic that Ms. Loucks and Mr. Nadaseski, working with ESB management, will be able to install a Peregrine nest box for the Spring 2005 season. We are happy to report that one of the positive results from our research may be the establishment of another successful pair of nesting Peregrines in the near future somewhere on the world's most famous building.

## Migrating Ospreys

On two occasions we observed Ospreys (*Pandion haliaetus*) in migration from the Observation Deck of the ESB. The first sighting occurred at 9:55pm on 26 September in the company of Mark Kolakowski of the Monmouth Co. (NJ) Audubon Society. The estimated altitude of the bird was 1550-1700 feet (475 m to 525 m). Weather conditions that night were clear skies, rising barometric pressure and 15-25 mph (following) winds from the northeast. On 26 October 2004 at 10:46pm, an Osprey was again observed heading south over the ESB. The altitude of the bird was approximately 1700 feet (525 m) and weather conditions were northerly winds of 15-20 mph and mostly clear skies. We believe these are the first direct observations of night migrating Ospreys made anywhere in the world. Other scientists have used satellite telemetry to show that Ospreys do make migration flights that extend well into the night. For example, it is not uncommon for an Osprey to set off for migration during the day, and make a long overwater crossing such that the bird must continue into the night until reaching land. This happens with Ospreys that take a short-cut from North Carolina over the Atlantic Ocean to Florida; or when making the 600 km crossing of the Caribbean Sea from the island of Hispaniola to the northern coast of Venezuela. However, our two night migrating Ospreys over New York City this autumn were very different from any others. Why? Our Ospreys had a choice to land in suitable habitat in or near New York City and rest for the night. They chose instead to migrate over land at night. More information about the importance of these observations, and extensive information about other raptor species that occasionally migrate at night throughout the world can be found in our paper: **Evidence of Nighttime Migration by Osprey in North America and Western Europe**. It will appear in the Journal of Raptor Research in 2006. Of our three co-authors, two are among the leading Osprey migration experts in the world: Dr. Rob Bierregaard Jr., of the University of North Carolina at Chapel Hill and Dr. Mark Martell, of the Minnesota Audubon Society. The third is Dr. Keith L. Bildstein, Director of the Hawk Mountain Sanctuary in Pennsylvania. We will make electronic copies available once our paper is in print.

## Other Migrant Species

We had quite a few surprises besides the raptor species noted above. In early August, we began seeing both Little Brown Bats and Red Bats catching moths and dragonflies above us. We were impressed with their falcon-like speed as they zoomed after insect prey, and we were just as impressed with the oft-successful maneuvers of insects to escape them. In mid-September we saw lone Common Nighthawks on three nights as these birds foraged on night-flying insects. Similarly, lone Chimney Swifts were seen on a few evenings in September (until the 24th of that month). At first we had difficulty identifying Chimney Swifts since they appeared to be pale in color from the lights of the building. Fortunately they stayed with us for several hours at a time, so we deciphered their distinctive wing strokes and could soon distinguish the swifts from the bats with confidence.

October brought migrating geese, ducks, shorebirds and waders, including Black-crowned Night Herons, Great Egrets and Great Blue Herons. For the season, we counted a total of 18 Great Blues, with a peak of 10 on 5 October. In November we began to see small groups of gulls moving south overhead at night, as well as the largest number of geese. We were surprised by the number of woodcock we saw. For the season we counted 103, with a peak of 36 counted on two different nights in early November. Future studies might show the magnitude of

the nocturnal American Robin flight that passes the ESB. On the peak Robin flight night (8 November) we had a flock of 12 pass us three hours after sunset. Overall, we counted less than 200 individuals of this species for the entire season, a very low count considering how many must migrate through our area, especially November-December. Finally, as if bringing the migration to a close, on 8 November a Short-eared Owl was seen in migration over the ESB at 5:59pm (EST), and a Saw-whet Owl came in at eye-level at 8:35pm (EST). We are unaware if anyone has ever seen either of these owls in migration at such height. In autumn 2004, the peak of the owl migration in our area occurred during the first ten days of November, based upon data provided by Ms. Katy Duffy, Director of the Cape May Owl Migration/Banding Project, now in its 24<sup>th</sup> year.

## Why Do Most Birds Migrate at Night?

Early researchers reasoned that birds migrate at night because they need to forage during the day. Night migration also permits small birds to safely cross vast expanses of space without being seen by predators. More recent research strongly suggests that there is a significant difference in the atmosphere itself for those birds that migrate at night versus those that migrate by day. At night, air temperatures are cooler, and this is better for a bird in powered (flapping) flight that needs to lose heat. Relative humidity is also higher at night, so birds lose less water via evapo-transpiration as they migrate. Finally, rising columns of warm air (thermals) are absent after sunset. These thermals are great for large, soaring birds like hawks that migrate during the day. However, for smaller migrants that flap all the way south, the atmosphere at night is much better with its horizontal (laminar) wind currents rather than vertical flow prevalent during the day. At night, with generally lighter winds and no bumpy thermals, small migrants that use flapping (powered) flight can stay on course and remain cooler much more easily. Other factors still remain true such as a bird's ability to utilize polarized light (at sunset) to determine precise geographical location, and to use the stars (at night) for navigation. For detailed information, see: Kerlinger, P. and F.R. Moore. 1989. Atmospheric structure and avian migration. *Current Ornithology* 6: 109-142.

## Summary

New York City may be the most important environment to study and protect. An enormous number and diversity of people live here in the midst of the greatest media outlet in the world. The Empire State Building presents an opportunity to experience, enjoy and study bird migration in the urban environment, the habitat where most people in the world will soon live, and one that migratory animals will increasingly encounter in their travels. The ESB can fulfill a dual role: it is an example of a superb Art Deco effort by humans to alter their environment, and a unique place for teachers/students, scientists, and organizations to study the environment. Nowhere else can birds be observed migrating at night in such number or proximity, nor Peregrine Falcons hunting them in the night sky. The conservation measures that the ESB sets in place to protect birds that migrate at night could become the standard for tall buildings throughout North America and the world.

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## **Part II. HISTORICAL AND RECENT ARTICLES ABOUT THE FALL MIGRATION OF BIRDS AT THE EMPIRE STATE BUILDING AND VICINITY, 1948-2004.**

**From:** The New York Times, 12 September 1948. Page 1, 3.

### **Fog Is Blamed as Birds Die Hitting Empire State Building**

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#### **Mist Bewilders Migrators, Sending Flights of Warblers, Red-eyed Vireos Crashing to Death --- Tiny Bodies Litter 5<sup>th</sup> Ave.**

Fog up the Hudson was held responsible for the death of hundreds of migrating birds that crashed into the Empire State Building early yesterday morning (11 September 1948), and plummeted to the street or setbacks of the skyscraper. For more than two hours, beginning about 1 A.M., the birds dropped to the sidewalks and street in Thirty-fourth and Thirty-third Streets and along Fifth Avenue. Many of the birds that survived the fall were run over by vehicles.

Pedestrians in the area, moved by the plight of the birds, tried to revive some of them on the spot, while others headed for restaurants or their homes with the creatures, hoping to feed them. Hardened policemen and American Society for the Prevention of Cruelty to Animal agents, who were separating the living from the dead birds and sending them to the A.S.P.C.A. hospital, were upset by the occurrence. Not only was the intermittent plop of the birds disturbing, but particularly weird was the shrill chirping of many injured birds that dropped to setbacks or ledges.

Though such incidents occur about this time every year as the birds migrate, this mass death was described by Lee Crandall, general curator of the Bronx Zoo, as the worst so far. An employee at the Empire State Building said more than 100 birds had been killed in this fashion about twelve years ago.

A subsequent check on the birds by experts identified twelve species, eleven of them warblers and the other a red-eyed vireo. This led to the conclusion that the birds were part of a large migration from northeastern states that heads for Central and South America about this time of year. Such migrations continue through October.

Mr. Crandall, who is curator of birds and mammals as well as general curator, was the first one to attribute the bird tragedy to fog. He said the birds had run into heavy fog on the way south to New York. This had caused them to lose their direction. When birds stray from their usual migration path or flyway, they become confused.

Under such conditions, he said, birds are drawn by the light. The light need not be very strong. "Once set off their course," he said, "they are done and just have to light where they can." The swarms of birds spotted the Empire State Building and crashed into it.

Information from the Weather Bureau and employees at the Empire State Building supported this theory. According to the local Weather Bureau, a mist was reported in the vicinity of Bear Mountain after midnight and developed into heavy fog during the next few hours. The birds were believed to have come down the Hudson Valley and into the fog area.

Secondly, about the time the first birds were reported over the city, the visibility was quite clear. This would have enabled the birds to see the Empire State Building. Apart from the red circle around the tower as an aviation precaution, there were some lights on in the upper floors, though not many. In addition, because it was a clear night, the windows of darkened rooms cast bright metallic reflections in all directions.

### **No Windows Broken**

No windows were broken, though employees said there was no doubt the birds had struck many parts of the building. Mr. Crandall said the birds, most of them smaller than canaries, were not likely to have crashed a window pane. He disputed the theory that holds that only young or small birds are killed by crashing into tall structures because the larger birds fly much higher. Mr. Crandall said ducks and geese had been killed in the same fashion. The curator also denied the birds died in this way on the southbound journeys, but rarely when heading north. He said such occurrences were equally frequent in the north and south journeys.

To prove that neither the Empire State Building nor New York City held any special reason for the mass death of birds, Mr. Crandall pointed to reports from Philadelphia and Nashville, Tenn., where similar tragedies were noted.

According to United Press, several hundred birds were killed in downtown Philadelphia after flying into tall buildings. The Nashville deaths were believed to have been caused when the birds were drawn into structures at the airport there by powerful beacons.

### **Many Ornithologists Appear**

The bird deaths drew to the scene professional as well as amateur ornithologists. Among those at the Empire State Building was Robert McClung, assistant in the Bird and Mammal Department at the Bronx Zoo. Mr. McClung persuaded employees at the building to let him out on the setbacks because by the time he got to the skyscraper at 9 o'clock, most of the birds had been removed from the streets by the Department of Sanitation.

He picked up thirty-three birds on the setbacks, seven of which were alive. The birds included two types of warblers that he said were comparatively rare. These species were the Cape May warbler and the Tennessee warbler.

Both birds are smaller than a canary. The Cape May warbler is olive green with black streaks and orange feathers just back of the eye. The Tennessee variety, while generally similar in coloring, does not have the orange feathers and has a light streak over the eyes. Other birds identified were the oven bird, northern water thrush, chestnut-sided warbler, bay-breasted warbler, magnolia warbler, northern yellow throat, black and white warbler, American red start and Canada warbler.

## Called Insect Feeders

Some ornithologists were concerned about the plight of birds that had lighted on the street near the Empire State Building and then had wandered from the area. These birds, they said, were insect feeders and might have trouble finding food unless they got to Central Park.

Bird lovers discussed precautions taken elsewhere to minimize bird deaths during seasonal migrations. They spoke of the European custom of having small terraces in basket shape around lighthouses or tall towers.

Though the Empire State Building is the result of more bird deaths than any other structure in the city, other buildings are in a similar category. One such structure is the Statue of Liberty, where many birds are found dead.

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**From:** Linnaean News-Letter (1949) Vol. 3: 1-2 (March 1949)

## The September Migration Tragedy

Arthur Aronoff

Field Work Committee, Linnaean Society of New York

Most New York newspapers of September 11<sup>th</sup> and 12<sup>th</sup>, 1948, had stories of hundreds of birds hitting the Empire State Building during the earliest hours of the eleventh. Reports were varied, and as usual, frequently were grossly exaggerated. One well-known tabloid, of large circulation, painted this “swan-song” picture: “It rained birds in New York a few hours before dawn yesterday – a brightly-feathered shower of dead songbirds lured to poetic doom by the lights of the city. Even as they fluttered earthward, their tiny bodies shattered by the stone of skyscrapers, thousands of others perched on window sills and warbled. It was a moment of funereal beauty such as has never been known here.”

Of course such a report is sheer nonsense. However, hundreds of migrating birds did lose their lives that morning by flying into the Empire State Building or by fluttering around it until they dropped from exhaustion. The most likely explanation is that the birds were moving southward with a cold air mass from the north, which was continually forced lower until they reached the level of the building. Whether or not any birds were actually attracted from a distance by the lights of the structure, or only those birds in whose migration path it stood came in contact with it, we cannot say. There is one explanation for the fatalities which has not been widely acclaimed and which also comes from a Newspaper: “ ‘Dem boids,’ one cabbie said tenderly, ‘must have been starving, so dey goes off lookin’ for a meal and den bang!’ ”

The writer arrived at 34<sup>th</sup> street on the afternoon of the 11<sup>th</sup> after all the dead birds had been removed from the streets. He managed to gain access to the garbage room of the Empire State Building and found a pile of birds that had been swept from the Building’s ledges. Half the pile was brought home, and in it were 198 individuals of 27 species.

The exact list is as follows:

Sora – 1	Black-throated Green Warbler – 2
Virginia Rail – 1	Cape May Warbler – 4
Veery – 1	Parula Warbler - 1
Bobolink – 1	Yellow Warbler - 1
Scarlet Tanager – 2	Tennessee Warbler - 1
Red-eyed Vireo – 8	Connecticut Warbler - 10
American Redstart – 18	Common Yellowthroat - 8
Ovenbird – 78	Blackpoll Warbler - 4
Northern Waterthrush – 10	Bay-breasted Warbler - 4
Black-throated Blue Warbler – 3	Nashville Warbler - 1
Worm-eating Warbler – 1	Magnolia Warbler - 11
Yellow-breasted Chat – 5	Black-and-white Warbler 10
Prairie Warbler – 2	Chestnut-sided Warbler - 8
Blue-winged Warbler – 1	

This list is not entirely representative of the proportions of the various species involved for several reasons, one being that several Red-eyed Vireos, Ovenbirds, and American Redstarts were rejected and not brought home and counted. Nevertheless the number of Connecticut Warblers is surprising, as is the fact that Ovenbirds were no more common than usual on the following day (at least in Central Park). This seems to indicate the possibility of a species migrating heavily past a point during a very limited “wave” or period of time, and being scarce at that same point a short time later.

Among the birds killed that night and taken to the American Museum of Natural History and the New York Zoological Society were three Baltimore Orioles, a Rose-breasted Grosbeak, and a Canada Warbler making a total of 30 species known to have been involved in the accident.

The same type of mass slaughter occurred on the same night in Philadelphia at the PSFS Building. According to the Philadelphia Inquirer 11 species of birds were killed, but the actual number was probably much higher. Since the New York Newspapers reported only about a dozen species as having been killed at the Empire State Building while actually the number was 30, a similar oversight may have taken place in Philadelphia.

Of the 11 species identified from Philadelphia, all but one, a Yellow-bellied Flycatcher, were among the New York casualties.

In Nashville, Tennessee a somewhat similar tragedy happened, but on the morning of the 10<sup>th</sup>, the day before the occurrence in New York and Philadelphia. In this city, however, the birds did not strike high buildings, but were found dead around an extremely powerful (30 million candle power) mercury arc light at Berry Field, a Nashville Airport. In this case the deaths could be attributed to powerful heat, the blinding light or to the birds actually striking the structure. Most likely it was a combination of all three.

According to Dr. George R. Mayfield of the Tennessee Department of Conservation, there were 35 species among the 248 birds studied. "There may have been a hundred or more birds that were not collected before they were swept up and thrown away, but the first number reported should certainly have been in the hundreds, not thousands." As can be seen from Dr. Mayfield's statement, exaggerated ornithological reports are not confined to New York Newspapers.

A (partial) list of the species killed at Berry Field follows:

Canada Warbler – 20	Black-throated Green Warbler – few
Yellow-breasted Chat – 20	Prothonotary Warbler – few
Kentucky Warbler – 9	Nashville Warbler – few
Black-and-white Warbler – 9	Red-eyed Vireo - 95
Tennessee Warbler 7	Bobolink – 1
Northern Waterthrush – 7	Baltimore Oriole – 1
Ovenbird – 6	Eastern Phoebe – 5
Magnolia Warbler – 5	Empidonax Flycatcher – 20
Common Yellowthroat – 4	Savannah Sparrow – 1
Yellow Warbler – 4	Olive-backed Thrush – 2
American Redstart – 4	Veery – 2
Louisiana Waterthrush – few	Pied-billed Grebe – 2
Connecticut Warbler – few	American Bittern – 1
Mourning Warbler – few	Sora – 1
Wilson's Warbler – few	
Chestnut-sided Warbler – few	
Blackburnian Warbler – few	
Cerulean Warbler – few	

Almost all the information of the Nashville Tragedy was obtained through the kindness of Dr. Mayfield, who sent the writer all the local newspaper clippings at his disposal, and from whose column most of the Nashville material was taken.

On the morning of September 11<sup>th</sup>, a good number of dead, dying and exhausted birds were found at the base of the 450 foot tower of radio station WBAL in Baltimore, but no details of this accident have been obtained.

On September 12<sup>th</sup>, the writer again visited the Empire State Building and was allowed out on the ledge of the first setback where several dead warblers from the previous day were found, and in addition, the following live birds: Rose-breasted Grosbeak (1); Ovenbird (1); American Redstart (1); and three unidentified warblers. Their condition was far too good for them to have been there since the previous morning, indicating that birds are probably frequently killed during migration by the building, but that this occurrence is only noticed when it is on a grand scale.

**From:** Audubon Magazine (1948) Vol. 50: 354-355

## Out of the Night Sky

Richard Pough

Curator of Conservation, American Museum of Natural History

Ever since the Egyptians erected the first Obelisk, man has delighted in rearing tall monuments. As his technical skill has increased, they have risen higher into the sky, but until the air age, they were never regarded as perils to mankind. Several tragic airplane accidents have, however, begun to make us realize the hazards they put in the paths of those who must travel the airways by night.

To the host of small, migratory land birds that twice a year traverse thousands of miles of night sky, danger from man-made obstacles is nothing new. Thousands of birds die annually against stone and steel which soars into what the birds believe to be open air. This toll will go on until the last skyscraper topples to earth.

Until recently the Empire State Building, rising 1450 feet above the streets of mid-Manhattan, had killed relatively few birds, although it had brought down an airplane. Then, on September 11<sup>th</sup>, 1948, shortly after midnight, birds started pelting against the Tower, and fluttering to the streets nearly a quarter of a mile below. Some were dead, some fatally injured, some only stunned – in all, many hundreds were killed that night. Over twenty-five different species were identified, mostly warblers with a scattering of vireos, grosbeaks, orioles, and others. No serious attempt was made to count the victims, to determine the proportion represented by each species, or to check the dead or injured birds for bands. Hoses and shovels cleared the streets quickly.

What happened on that particular night to cause such exceptional bird mortality? Anyone who has listened to the calls coming in from the night sky knows that each fall the air overhead is filled with southbound migrants night after night, yet mass accidents of this sort are comparatively rare. During these migrations, birds do not appear to travel as organized flocks. Each individual is on its own and many species will be simultaneously traveling the same airways. Seldom do they appear to be compact flocks that would suffer such a high mortality only should the flock by chance happen to strike a building.

To understand the disasters which occasionally overtake these nocturnal migrants, we must know something of the way in which birds ride moving masses of air in their migrations. Hawk Mountain and the many recent studies of the diurnal migrations of hawks have made us realize how skillfully these large birds use thermals and the powerful updrafts over mountain ranges to maintain their altitude while gliding southward. Few persons realize, however, to what a great extent the host of small nocturnal, outnumbering the diurnal ones by probably thousands to one, use the horizontal currents of the atmosphere to carry them on their way.

It is a mistake to think that the direction in which the air is moving along the bottom of the air ocean is any indication of its direction at other levels. How the birds select the elevation which will place them in an air mass moving most rapidly in the general direction that they wish to travel no one knows, but the testimony of aviators such as Neil T. McMillan (*Bird-Lore*,

November-December 1938, p. 397) seems to indicate that they are able to do so. It would appear from the lack of mortality at even the highest man-made structures under normal circumstances, that birds usually fly high enough to clear all obstructions. And it appears that they are quite willing to go higher if necessary in order to be able to ride an air mass moving in an exceptionally favorable direction. Only the lack of a southbound air mass at a greater height would seem to account for birds being low enough to hit obstructions like the Empire State Building.

A check with the New York Weather Bureau indicated that this was exactly the situation on the morning of September 11<sup>th</sup>. A mass of cold southward-flowing air had just reached New York City, and as forced upward, and being overridden by, a mass of northbound warm air. Cold air being dense is heavier than warm air, and flows under it – like molasses under water – the advancing edge of the flow often being only a few hundred feet thick.

Let us assume that the birds took off at nightfall from a point to the north into this mass of air which was moving in a favorable direction. Once in the air they move with it, but because they were adding their own flight speed to the velocity of the air they traveled in, they approached closer and closer to the shallow southward-moving cold front. Presumably, the birds must have had to fly lower and lower as they progressed, in order to avoid the adverse, overriding, northward bound mass of warm air. Thus, the stage was set for an object reaching far into the sky to intercept part of the great host of moving birds that probably filled the air on that night all along the Atlantic seaboard.

Maybe the glow from the lighted mooring mast drew a few birds slightly off their path into the Tower. Possibly low clouds caused by the chilling of the moist warm air above, along the zone of its contact with the cold air that was flowing below it, added to the toll. The fact remains, however, that regardless of the secondary influence of such factors, the stage for the disaster was actually set by the shallowness of the southbound air mass over New York City. Judging from the scarcity of similar disasters in the spring, when northbound birds would avoid southward-moving masses of heavy cold air that because of their density move close to the earth, the foregoing meteorological conditions probably account for most of these autumnal disasters to birds of passage.

*Richard Pough established The Nature Conservancy. When not at his summer home on Martha's Vineyard, he lived in Pelham, New York.*

In the February 1971 issue of *American Birds Magazine* (vol. 25, No. 1), Aaron Bagg in the column, *The Changing Seasons*, reported on the radar and ceilometer research of Dr. Ken Able in Athens, Georgia. According to Dr. Able, "...the night of Sept. 28-29, 1970: Under crystal clear skies the largest migration I have ever seen took place. The birds were going due south here, and the traffic rate of 200,000 birds per mile of front per hour is, to my knowledge, the largest traffic rate ever recorded, either on radar or moon watching." It is worth noting that the next two highest traffic rates which Mr. Able recorded during this season were: 80,000 the night of October 15-16, 1970; and 50,000 the night of October 16-17, 1970 (p. 22).

**From:** Proceedings of the Wind Energy and Birds/Bats Workshop: Understanding and Resolving Bird and Bat Impacts Washington, DC. May 18-19, 2004

### **Radar Studies of Nocturnal Migration at Wind Sites in the Eastern US**

Brian Cooper

“Passage rates varied widely from night to night, as well among sites within a night, but were found to be fairly stable over the course of any given night. Fall observations from the five sampling sites at the Mt. Storm site yielded mean fall nocturnal passage rates of 54-241 targets[birds]/km/hour. This is comparable to mean fall nocturnal passage rates (130-242 targets[birds]/km/hour) found at three sites in New York State; and higher than the fall rates (83-108 targets[birds]/km/hour) observed in Minnesota; or at two western wind sites (27-40 targets[birds]/km/hour at a site in South Dakota, and 19-26 targets[birds]/km/hour at sites in Oregon.

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**From:** The New York Times, 4 March 1956. Page 28.

## **Conservation Ten-Year Plan**

### **Empire State**

By John B. Oakes

The installation of four giant searchlights atop the Empire State Building, creating the “brightest continuous source of man-made light in the world,” is bad news for birds and bird lovers. The great beacons, more than 1,000 feet above street-level, will produce light totaling 2 billion candlepower, visible from aircraft 300 miles away. One of the lights will shoot vertical aloft, the other three will slowly revolve all night long, at an angle 5 degrees above horizontal. They will go into operation March 31.

Unless preventative measures are taken, these beacons could result in the death semi-annually of literally thousands of migrating birds. Something of this sort has been occurring at various airports in various parts of the country, where ceilometer beams – vertical lights used to measure the heights of cloud ceilings – have attracted birds in large numbers, blinding them and causing them to crash themselves in panic against buildings or the ground. John K. Terres describing the ceilometer problem in a January-February issue of Audubon Magazine notes that after much research the use of filters producing only ultra-violet light seems to be the solution. This light is invisible to birds (as well as humans) but still permits satisfactory operation of the ceilometers.

Since the purpose of the Empire State Building is obviously to be seen, the filters have to ruled out. But it is not beyond the bounds of reasonableness to ask that the lights – particularly the steady, vertical light which will be the most dangerous to birds – be extinguished during the few weeks of the spring and autumn migrations. That would be a small price to pay to avoid the almost certain destruction of literally thousands of birds every year.

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**From:** The New York Times, 25 September 1957.

### **50 Migratory Birds Hit Empire State** (Anonymous)

About 50 birds were killed or injured yesterday when they crashed into the Empire State Building during the night while on their seasonal migrations. The birds which were of several varieties, fell to the sidewalk and on setbacks of the upper level of the building.

Nearly every autumn, migrating birds crash into the 1472-foot building. Explanations include poor night vision, attraction to light and wind gusts.

In an attempt to protect the birds, the all-night beacon will be turned off until Nov. 1.

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**From:** The New York Times, 9 April 1958.

### **Empire State Building to Cut Light for Birds** (Anonymous)

The millions of birds now starting their northward migration again will get cooperation from the Empire State Building.

This was announced yesterday by the Empire State Building and the National Audubon Society. The building will turn off its stationary welcoming beacon from next Monday (April 16) to June 1 to prevent migratory birds from becoming confused and crashing against buildings.

The building's revolving, "Freedom Lights," will operate as usual. Ornithologists do not consider these to be as dangerous to migrating birds as stationary beacons.

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**From:** The New York Times, 10 April 1968.

### **Empire State Will Go Unlighted to Aid Birds** (Anonymous)

The Empire State Building's tower floodlights will not be turned on foggy or cloudy nights from next Monday through May 31<sup>st</sup>, to keep migrating birds from flying into the building.

The lights which illuminate the upper 30 floors will be left off because birds returning north might otherwise fly into the building. This is the thirteenth year that the world's tallest building has cooperated with the National Audubon's Society request to switch off the lights.

In the past, migrating birds have been confused by light diffused through clouds or fog and have lost their direction. In the fall, the lights will again be turned off from Sept. 15 through Nov. 1 for the birds' migration south.

**From:** The New York Times, 16 April 1970.

**Empire State Building to Cut Light for Birds**  
(Anonymous)

The floodlights illuminating the upper floors of the Empire State Building will be turned off from dusk until midnight from now till May 31 so that migrating birds returning north this spring will not become confused and fly into the structure. In the fall, the lights again will be turned off from Sept. 15 till Nov. 1 for the southbound migration. The procedure was begun in 1955 at the urging of the National Audubon Society.

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**From:** The Auk

**Citation:** Brooke, R.K. 1973. House Sparrows Feeding at Night in New York. Auk 90: 206.

Maurice Broun (Auk 88: 924. 1971.) regards House Sparrows, *Passer domesticus*, foraging for insects at night as unusual, and I believe it is. While holding a Frank M. Chapman Memorial Grant to study material in American museums I observed numbers of House Sparrows foraging for insects at ca. 11:30pm one night in August 1968 in the floodlights around the observation floor of the **Empire State Building** in Manhattan, New York. The floor is some eighty stories up. For those who regard the House Sparrow as an interesting bird, Manhattan is not an ornithological desert.--R. K. BROOK, P.O. Box 1690, Salisbury, Rhodesia. Accepted 31 Jan.72.

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**From:** New York State Bird List (email forum)

**Date:** Sunday, 12 Sep 2004

**Subject:** Migrant birds caught in the WTC memorial beams

As I'm sure everyone is aware, the Twin Towers "Tribute In Light" memorial consists of two immense [ceiometer] beams of light projecting up from the WTC site seemingly to infinity. This clear evening the beams were appropriately vivid.

Sitting at an outdoor cafe at around 10 pm, I happened to glance up at the beams and noticed thousands of tiny specks circling in the columns of light. Later armed with binoculars I could confirm that these specks are indeed thousands of birds. Others had noticed the birds and on seeing me using binoculars asked for confirmation.

The numbers are very difficult to estimate but I would say in excess of 5000 individuals and comprising a variety of different sizes. The strong glare prevented further identification. The birds are circling around and within the beams, occasionally crossing from one column of light to the next. The densest concentrations seem to be in the lower section (first 500 to 1000 ft?), with fewer visible in the higher sections. Numbers were undiminished at ~1 am.

Angus Wilson  
New York City

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**From:** The New York Times, Sunday, October 10, 2004.

**F.Y.I.**  
**'Towers of Light' Awe**

*Q. The night of Sept. 11, I was baffled by the material that circled in the air illuminated by the "Towers of Light" memorial at ground zero. From Houston Street, it appeared as though thousands of little stars were suspended in the air. How was this magical effect accomplished?*

**A.** Mother Nature did it by surprise with thousands of little moths in the lower part of the display, and early the next morning, thousands of birds higher up.

"They were ordinary moths but somehow the intensity of the light seemed to magnify them," said Frank E. Sanchis III, senior vice-president of the Municipal Art Society, which has a five-year grant to operate the Tribute in Light.

The flickering show was unexpected, because the previous two illuminations produced no such display. But this year, the moon was not visible to distract the birds or moths during the display and the night was very calm. The updraft from the heat of the light caused the moths to circle upwards 15 stories and higher, he said.

About 1:30am, thousands of birds were drawn to the columns for the first time, said Marcia Fowle, president of the New York City Audubon Society. "It was probably good weather for everyone to migrate," she said.

The Federal Aviation Administration and New York City Audubon can demand a shutdown if the Towers of Light endangers planes or birds, Mr. Sanchis and Ms. Fowle said. Audubon has been concerned that the distraction of the light display could tire migrating birds, but there appeared to be no casualties.

Many people saw different things in the shadows and reflections. Some people thought they were specks of dust. Some people saw ashes. Some thought they were fireworks in the light columns. Some saw spirits. There were also big beetles and the occasional bat looking for a meal.

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**From:** Geographica (Selections from National Geographic - 2004)

**Excerpt:** Fatal Attraction (excerpt)

According to Michael Measure, Director of the Fatal Light Awareness Program in Toronto, "**Fatal strikes during the day far exceed those at night.**"

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**From:** Audubon Magazine September-October 2004

**Excerpt:** Audubon State of the Birds – USA 2004

## **The Big Picture**

Greg Butcher, Director of Bird Conservation for National Audubon

“Threats to avian life in the United States are many, but the most serious is the outright loss of habitat due to poor land use, the clear-cutting of forests, the draining of wetlands, and sprawl. Even when habitat is not totally lost, it is being degraded by poor agricultural practices, bad forestry practices, excessive water diversion, unsustainable mining and drilling, pollution, exploitation of resources (particularly commercial over-fishing), and invasive non-native species (which include predators, plants, insects, diseases, and even other birds).”

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**From:** Field Notes (Robert DeCandido)

**Date:** Sunday, 10 October 2004

Despite the blustery conditions, there were some exciting moments for the remainder of the evening on Sunday night. The skies became mostly clear after 9pm, and this facilitated seeing the migrants against a black background. Many people on the deck watched in amazement as a Peregrine Falcon, soaring about 75 feet above us, made repeated stoops at the migrants from 9:15pm onwards. About 40 people from several countries (and Adam from Rochester who photographed the soaring Peregrine with his Canon Digital camera) watched the Peregrine make 25 dives and catch 7 birds in the span of approximately 30 minutes. The falcon would catch a bird, drop it off, zoom out from the building and then "wait on," hanging in mid-air above the Observation Deck for the next group of migrants (or an individual) to appear. There were many misses too, but it seemed like the falcon was sometimes not fully engaged in those attacks. After 10:30pm, two falcons were flying about the Tower, mostly out of my sight on the south side of the building. I had to leave at 10:55pm.

There were about 415 migrants counted between 10-11pm, and approximately 700 for the night (7-11pm). No birds collided with the building, and the flight pattern of the migrants was similar to past nights when winds were strong (> 15mph): birds primarily came around the west side of the building, facing into the wind (so they looked sideways when they were above us) and flapping madly. I believe they do this so that they have more control in the way they pass a structure that they perceive could be a hazard if not negotiated properly. By facing into the wind, the migrants can exercise finer maneuvers than if they just let the wind carry them (i.e., a tail wind). Once they made the turn and were mid-way past the building at a point directly above us, they turned south again and let the wind carry them at more or less full speed. We watched them zoom away.

Some birds are never affected by building lights at night in the ESB: among these are Peregrine Falcons, migrating shorebirds, ducks, geese and others such as Great Blue Herons. They fly past with no problems that I have ever seen. I have come to the conclusion that response to lights at night varies from individual bird to individual bird because of those that are killed, not all members of that species are attracted to light. Some birds will be killed on every night in NYC. Of these, some will be attracted to lights, some will hit buildings, some will hit plate glass, some will end up starving because they land in poor quality stopover habitat, and others

will be blown out over sea and perish (unless they land on a ship). Birds die for many reasons: habitat loss and degradation of existing NYC habitats are critical ones. Unfortunately, we have no idea of how birds fare once they land in and begin feeding in NYC parks.

Even on foggy nights birds know where the Empire State Building is. I have seen how they fly round and round and then move off. That birds collide on such nights is well known and documented. I can email anyone interested a list of articles and newspaper accounts of such nights. So on nights when many birds are killed, something qualitatively different is happening after midnight than during the hours when I can watch them (7-11:45pm). Until someone actually sees and studies what happens when birds collide here with buildings high above NYC, we can only speculate. The policy of lights out or lights on may need to vary from building to building. For example, the policy might depend on whether the building is mostly glass (Trump Tower/United Nations) or mostly solid (like the ESB). Overall, how large plate glass windows affect migrating birds is an issue that needs to be examined in greater detail. Personally, I think that plate glass combined with indoor lighting at street level is a greater hazard to migrating birds in New York City, especially near dawn as birds begin looking for a place to land and begin feeding.

Tonight (Monday, 11 Oct. 2004) promises to be a fine night to see migrants, and it appears that Friday evening after the next cold front passes will be good again. To watch birds migrating is a wonderful experience, one that everyone seems to enjoy. To hear birds calling at night is great, too. It can be downright noisy at times! Put a Peregrine up there and it adds to the experience. The night migration of birds could be such a spectacular experience for many people and birders here in NYC. Many people know only conceptually that most birds migrate at night. To see and experience the migration with one's own eyes, surrounded by the spectacular view of NYC at night, is to make that knowledge real. The real challenge then is how to make this a fun experience for as many people as possible so that they come away wanting to know more about birds, and wanting to become stewards of the environment.

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**From:** Paul Kerlinger, PhD

**Date:** Monday, 11 October 2004 (email message to rdc and others)

This is really important stuff, both from a biological and conservation perspective. My first reaction to the ESB studies is that they would be neat, but would they be valuable from a bio and conservation perspective? However, as I read the new messages from Bob and his team, some real patterns are emerging that we can really learn from.

The following points are what I'm getting out of Bob's obs.

1. Birds are plastic in their behaviors - like Peregrines foraging at night in city lights. We often view birds as unable to learn or adapt quickly, but ... it seems some do.
2. Some hawks migrate at night.
3. Variability among individuals with respect to attraction to lights. Communication tower lights and other lights have been around for more than 50-100 generations of birds, making me wonder if there hasn't been selection against those birds that are most attracted to the lights. We are

seeing far fewer birds collide with the tall communication towers now than decades ago. That can be explained by (a) smaller bird populations of some species, so that fewer birds collide these days; (b) there are more lights in the night sky, so birds are less attracted to a single tower (diffusion of fatalities over a larger number of towers, and fewer large-scale collision events); (c) there are more towers now than in decades past, so fatalities may be more diffuse with single towers accounting for a smaller percentage of the birds killed, but the same numbers of birds being killed overall; and/or (d) by adaptation such that fewer birds are now attracted to lights. Those birds that are most susceptible to attraction are dying and not leaving their genes... Possible??? After 50-100 generations of lights in the night sky ...

4. Waterfowl, shorebirds, and some other birds are not attracted to lights. This is very important because these birds aren't involved in large scale fatality events at communication towers or wind turbines. Some of us have suspected for some time that these birds simply aren't attracted to tower and other lights, which would explain their scarcity on fatality lists at towers and wind turbines.

I look forward to seeing Bob et al. publish some papers so that more of this story can be told and told to more people. It's great stuff!

Paul Kerlinger

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Owl in Flight © Deborah Allen

### Also Available:

Spring 2004 Visible Night Migration of Birds at the Empire State Building, New York City, New York. In Adobe Acrobat (PDF) Format.

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