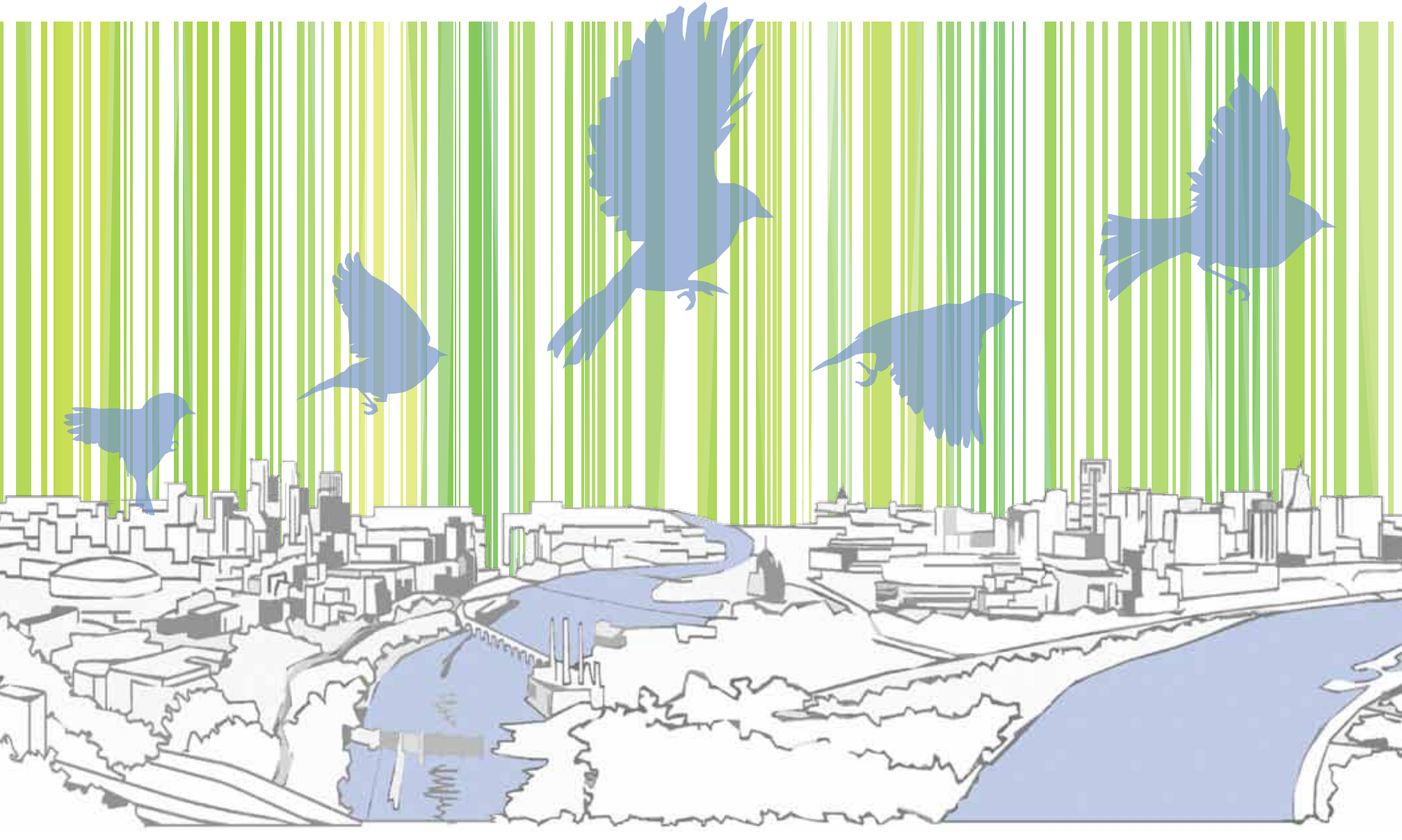
BIRD·SAFE BUILDING GUIDELINES

Audubon
MINNESOTA



Bird-Safe Building Guidelines


JIM WILLIAMS


MIKE LENTZ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Over 100 bird species have been recovered from building collisions in Minnesota including Lincoln's Sparrow, Black-capped Chickadee, Indigo Bunting, Common Yellowthroat, and Nashville Warbler

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The mission of Audubon Minnesota is to conserve and restore natural ecosystems, focusing on birds and their habitats, for the benefit of humanity and the earth's biological diversity.

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MIKE LENTZ

Dark-eyed Junco

Bird-building collisions are an unfortunate side effect of our expanding built environment and a proven problem in Minnesota and throughout the world.

These are just a portion of the birds collected from Toronto window collisions in 2009.

KENNETH HERDY

GLAZED BUILDINGS THAT MAKE UP MODERN CITY skylines and suburban settings along with countless windows in our homes present serious hazards for birds. In the United States, hundreds of millions of birds perish each year from collisions with buildings.[1]

In Minnesota, bird-window collisions are a proven problem. Over 100 species of birds have been documented at just a small number of buildings being monitored throughout the state. Birds are killed or injured as a result of clear and reflective glass. Artificial lighting also confounds night-migrating species.

In addition, increased interest in "building green" often results in both desirable habitat for birds and large expanses of glass – a deadly combination.

Fortunately, awareness and preventative actions are emerging. Internationally, Lights Out programs are aiding night migrants in a growing number of cities. And by incorporating bird-safe building design strategies as part of an integrated sustainable design program, we can help save countless resident and migratory birds.

These Bird-Safe Building Guidelines expand upon ongoing Project BirdSafe initiatives in Minnesota to address bird-building collision issues at the building design level. Utilizing New York City Audubon's 2007 Bird-Safe Building Guidelines and other resources, established standards for bird-safe building enhancements have been updated and adapted to provide local examples and references.

NYC AUDUBON

Injured Golden Crowned Kinglet

These guidelines are intended for use by those involved in building design and operations. They promote measures to protect birds in the planning, design, and operation stages of all types of buildings, in all settings and have been updated to reflect implementation criteria in LEED® v3 (2009).

Bird-safe building criteria are scheduled to be incorporated into B3 State of Minnesota Sustainable Building Guidelines (B3-MSBG) in 2010. B3-MSBG is required for all new construction and major renovations that receive state bond money. B3-MSBG covers the planning, design, construction, and operation of buildings.[2]

"ARCHITECTS AND THEIR CLIENTS CAN USE ALL THE RECYCLED MATERIAL THEY WANT. THEY CAN SAVE ALL THE ENERGY THEY WANT, BUT IF THEIR BUILDING IS STILL KILLING BIRDS, IT'S NOT GREEN TO ME."

Dr. Daniel Klem, Muhlenberg College, *Audubon,* Nov-Dec 2008

DID YOU KNOW?

Birds are an important asset to the travel and recreational sectors of the economy. According to the United States Fish and Wildlife Service, bird-watching is the second fastest growing leisure activity in North America. An estimated 63 million Americans participate in wildlife watching and eco-tourism each year. In the process, they spend close to $30 billion annually, with a major portion related to birds.[3] With fully one-third of Minnesotans self-identifying as bird-watchers,[4] the health of our birds and their habitats is economically as well as ecologically imperative.

Birds and the Built Environment

Bird populations, already in decline from loss of habitat, are further threatened by the incursion of man-made structures into avian air space.

Low-density development generally results in habitat loss

Architectural trends favor use of glass

JOEL DUNNETTE

Stunned Brown Creeper

IN RECENT DECADES, sprawling land-use patterns and intensified urbanization have degraded the quantity and quality of bird habitat throughout the globe. Cities and towns cling to waterfronts and shorelines, and increasingly infringe upon the wetlands and woodlands that birds depend upon for food and shelter. Loss of habitat makes city parks, streetscape vegetation, waterfront business districts, and other urban green patches important resources for resident and migratory birds. There birds encounter the nighttime dangers of illuminated structures and the daytime hazards of dense and highly glazed buildings.

The increased use of glass poses a distinct threat to birdlife. From urban high-rises to suburban office parks to single-story structures, large expanses of glass are now routinely used as building enclosure. Energy performance improvements in transparent exterior wall systems have enabled deep daylighting of building interiors, often by means of floor-to-ceiling glass expanses. The aesthetic and functional pursuit of still greater visual transparency has spurred the production of ultra-clear glass.

The combined effects of these factors have led scientists to determine that bird mortality caused by building collisions is a biologically significant[5] issue. In other words, it is a threat of sufficient magnitude to affect the viability of bird populations, leading to local, regional, and national declines.

Songbirds – already imperiled by habitat loss and other environmental stressors – are especially vulnerable during migration to daytime and nighttime collisions as they seek food and shelter among urban buildings. Researchers have documented hundreds of thousands of building collision-related bird deaths nationally during migration seasons. Included in this toll are specimens representing over 225 species, a quarter of the species found in the United States.

DID YOU KNOW?

Buildings contribute substantially to greenhouse gas emissions, which in turn adversely impact native and migratory birds. Building operations consume over 75% of the electricity in the U.S. In 2007, the commercial building sector alone produced more than 1 billion metric tons of carbon dioxide, an increase of 4.4% from 2006 levels, and an increase of over 38% from 1990 levels.[6] Research provides clear evidence of the negative effects of climate change on the migration, breeding, numbers, and behavior of many North American bird species.[7]

Birds and Building Green

SUSTAINABLE, HIGH-PERFORMANCE BUILDINGS are designed to conserve energy and reduce carbon emissions, conserve water resources, harvest daylight and provide healthy indoor environments. These buildings conserve and recycle materials and display unprecedented levels of environmental responsibility and functionality. They are integrated with their natural surroundings and often enhanced with native landscaping.

The green building movement is an exciting advancement for architects, designers, building users and conservationists alike. But it is not without pitfalls. Unless carefully considered, greening efforts may actually contribute to the loss of the very creatures we seek to protect. Ironically, in our desire to bring the outside in, we may increase risks to birds. By attracting birds in and around glazed buildings we inadvertently increase the risk of bird-window collisions. Better sustainable design practices therefore demand that buildings also be designed to integrate specific bird-safe strategies.

Advocating bird-safety in buildings should be integral to the green building movement. Many of the strategies for reducing bird collisions complement other sustainable site and building objectives. In concert, efforts to reduce collision hazards, enhance and restore habitat and conserve energy help native and migratory birds.

While development poses a myriad of risks to birds, the movement towards sustainability and collaboration offers hope. Those leading the shift to building green are well suited to stimulate the development of new glazing technologies and to create a market for all bird-safe building products. If builders and developers demand it, much-needed advancements will follow.

Bird populations are remarkably resilient and can respond well to conservation efforts. By incorporating bird-safe building design strategies as part of an integrated sustainable design program, we can help birds thrive in our built environment.

"THERE IS NOTHING IN WHICH THE BIRDS DIFFER MORE FROM MAN THAN THE WAY IN WHICH THEY CAN BUILD AND YET LEAVE A LANDSCAPE AS IT WAS BEFORE."

Robert Lynd, *The Blue Lion and other essays*

A green roof is one way we "build green"

MIKE LENTZ

American Redstarts weigh less than 1/2 ounce but their migration route may cover more than 2500 miles

Causes of Collisions

Birds have two key issues with buildings – one relates to glass, the other to lighting.

DAYTIME COLLISIONS occur because most birds do not perceive glass as an obstacle. Migratory birds in particular have not evolved to live in built environments and don't see the context cues that indicate that glass is solid.[8] Instead they see the things they know and need, such as habitat and open sky, reflected in the glazed surface or on the other side of one or more panes of glass.

Collisions occur at glass facades of all sizes, in all seasons and weather conditions, and in every type of environment from residential and rural settings to dense urban cores. Collisions and mortality occur at any place where birds and glass coexist.[1] As a result, daytime collisions are likely the most prevalent of all building collision hazards.

PROBLEM GLASS REFLECTIVITY: MIRROR EFFECT

Problem: Reflection

From outside most buildings, glass often appears highly reflective. Under the right conditions almost every type of architectural glass reflects the sky, clouds, or nearby trees and vegetation, reproducing a perceived habitat familiar and attractive to birds. Birds fly from the real habitat to the reflected habitat or sky and hit the glass in between.

PROBLEM GLASS TRANSPARENCY: FLY THROUGH

Problem: Transparency

The trick of transparency is exacerbated when windows are installed directly across from one another or at a corner because birds perceive an unobstructed passageway and attempt to fly through the glass. In Minnesota, glass linkways and skyways are commonly used to protect people from the elements and often cause bird collisions.

NIGHTTIME COLLISIONS occur because the illumination of buildings creates a beacon effect for night-migrating birds. When weather conditions are favorable, these birds tend to fly high (over 500 feet) and depend heavily on visual references to maintain their orientation. However, during inclement weather, they often descend to lower altitudes, possibly in search of clear sky celestial clues or magnetic references and are liable to be attracted to illuminated buildings or other tall lighted structures.

Night lighting also affects daytime collisions by temporarily increasing the number of migratory birds in urban areas. When the sun rises and those "trapped" birds begin to move about, forage or seek an escape, they often encounter the deadly effects of reflective and transparent glass.

"Even the darkness moves with the passage of birds. On soft spring midnights, the air is alive with the flight notes of unseen birds filtering down through the moonlight like the voices of stars."

Scott Weidensaul,
Living on the Wind

PROBLEM BEACON EFFECT

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Heavy moisture (humidity, fog or mist) in the air greatly increases the illuminated space or "skyglow" around buildings, regardless of whether the light is generated by an interior or exterior source. Birds become disoriented and entrapped while circling in the illuminated zone and are likely to succumb to exhaustion, predation, or lethal collision.

Problem: Beacon effect, illumination

PROBLEM ILLUMINATED ATRIA

When night-migrating birds become trapped in a dense urban area they often fly towards illuminated lobbies and atria on lower levels. Potted plants inside the glass can be a deadly lure as birds seek safety and do not perceive the glass in their way.

DID YOU KNOW?

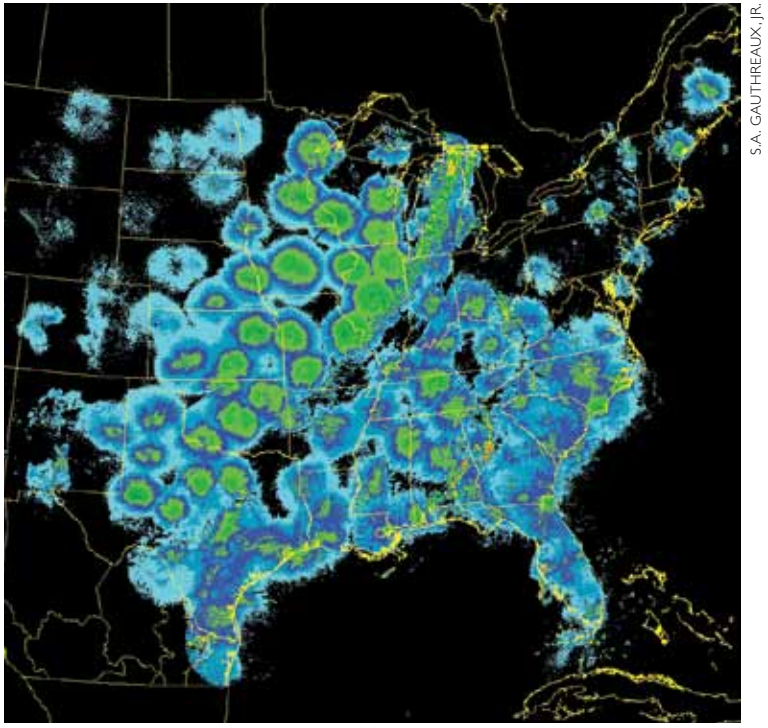
In addition to the adverse impacts on migrating birds, significant economic and health incentives exist for curbing light pollution. Overly lit buildings waste tremendous amounts of electrical energy, increasing greenhouse gas emissions and air pollution levels, and of course, wasting money. Researchers estimate that the United States alone wastes over one billion dollars on electricity annually because poorly designed or improperly installed outdoor fixtures allow much of the lighting to go up to the sky.[9] In addition to the threat this poses to birds and other animals, "light pollution" has significant aesthetic and cultural impact as well. Studies estimate that over two thirds of the world's population can no longer see the Milky Way, which humans have gazed at with a sense of mystery and imagination for millennia. Together the ecological, financial and aesthetic/cultural impacts of excessive lighting serve as compelling motivation to reduce and refine light usage.

Factors Affecting Bird Collisions

MIGRATION IN MINNESOTA

Minnesota is on the Mississippi Flyway. About 40% of all North American waterfowl and 326 species of birds (1/3 of all species in North America) use the Mississippi Flyway on their spring and fall migrations. Our peak migration months are May, September and October.

PLANNING BIRD-SAFE ENVIRONMENTS for both new and existing buildings requires an assessment of existing conditions. Conditions affecting bird collisions include migration, proximity to stopover locations, proximity to feeding grounds, glass coverage and glazing characteristics, building orientation and massing features, lighting, weather conditions, and building height.



Radar captures masses of migrating birds as seen from each station

MIGRATION. Collisions tend to increase each spring and fall when local bird populations are boosted by a huge influx of migrants traveling between breeding and wintering grounds. Songbirds travel primarily at night in a "broad-front" migration following several major flyways. These historic routes follow major rivers, coastlines, mountain ranges, and lakes. Along the way densely built urban areas have become migration danger zones.

S.A. GAUTHREAUX, JR.

Glass hi-rise near key habitat

PROXIMITY TO STOPOVER LOCATIONS. Birds make stopovers in waterfront, wetland, grassland, and wooded environments that are now America's most densely populated urban areas. Migrating birds have a significant chance of encountering at least one major metropolitan area during migration between breeding and wintering grounds. Birds need stopover sites to refuel. Building sites located near bird feeding areas, waterfront habitat, or patches of urban vegetation experience increased risk of bird collisions.

Birds use urban green spaces

PROXIMITY TO FEEDING AND HABITAT AREAS. Sites bordering parkland, pocket parks, habitat patches, green roofs, and street-tree corridors threaten birds since they forage in these areas for food. Building sites near water bodies and wetlands – no matter how small – put both resident and migrant species at risk. Suburban building sites with proximity to natural landscapes also present a range of hazards and can be even more dangerous to birds than urban settings.

How a building is situated on a property affects collision rates

BUILDING ORIENTATION AND MASSING FEATURES. Since migratory routes are broad and flight patterns vary, one cannot simply address building facades that face an assumed direction of migration. The impacts of all facades, with special emphasis on those adjacent to landscapes or other features attractive to birds, must be considered. For example, landscaped courtyards and glass vestibules can be very confusing and difficult for birds to negotiate.

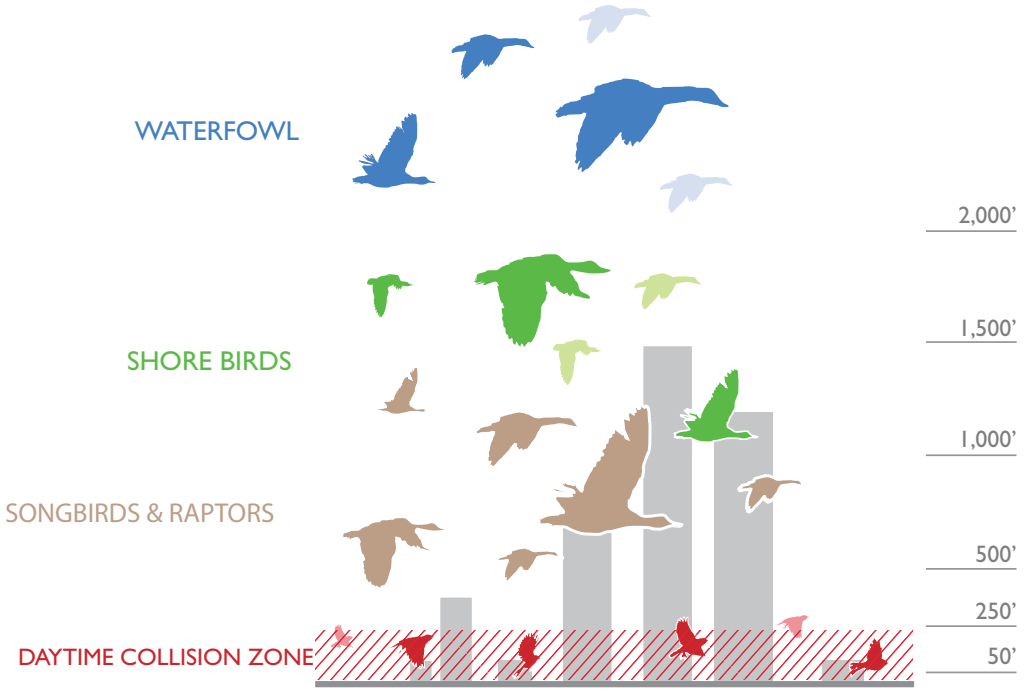
Glass confuses birds by reflecting sky or habitat

GLASS COVERAGE AND GLAZING CHARACTERISTICS. A major determinant of potential strikes is the sheer percentage of glass used on the building facade. In general, collisions will occur wherever glass and birds coexist. Ground level and low stories are the major collision zones. At these levels large expanses of monolithic glazing should be minimized, glazing reflectivity (especially when adjacent to landscapes) reduced, and "fly-through" situations eliminated.

NYC AUDUBON

Bright lighting oriented skyward draws birds in

LIGHTING AND WEATHER. Regions that are prone to haze, fog, mist, and/or low-lying clouds may see more frequent bird-kills, especially if the area contains tall buildings that are highly illuminated. Generally, there are fewer birds aloft during precipitation; however, inclement weather can develop, reducing their navigational awareness and forcing them to fly at lower altitudes in search of visual clues. Heavily illuminated buildings in their path can serve as deadly lures.



Fox & Fowle Architects - Bruce Fowle, E.J. McAdams, March 11, 2005

BUILDING HEIGHT

TALLEST:
While birds' migratory paths vary, radar tracking has determined that approximately 98% of flying vertebrates (birds and bats) migrate at heights below 1640 feet during the spring, with 75% flying below that level in the fall.[10] Today, many of the tallest buildings in the world reach or come close to the upper limits of bird migration.[11] Storms or fog, which cause migrants to fly lower and can cause disorientation, can put countless birds at risk during a single evening. Any building over 500 feet tall is an obstacle in the path of avian nighttime migration and must be thoughtfully designed and operated to minimize its impact.

MODERATE HEIGHT:
Buildings between 50 and 500 feet tall pose hazards since migrating birds descend from migration heights in the early morning to rest and forage for food. Migrants also frequently fly short distances at lower elevations in the early morning to correct the path of their migration, making moderate-height buildings, especially if reflective or transparent, a serious hazard.

LOWER LEVELS:
The most hazardous areas of all buildings, especially during the day and regardless of overall height, are the ground level and bottom few stories. Here, birds are most likely to fly into glazed facades that reflect surrounding vegetation, sky and other attractive features.

Many urban areas, like Saint Paul (above) have developed along key migration corridors like the Mississippi River

Project BirdSafe

PROJECT BIRDSAFE WAS ESTABLISHED IN MINNESOTA in 2007 as a result of growing international concern over the impact of bird collisions. Minnesota joins a growing network of individuals and organizations working to reduce hazards to birds from building collisions. Key Project BirdSafe initiatives include Lights Out, research, building monitoring, and bird safe buildings.

Minneapolis before and after "Lights Out" on the same April night

PER BREIEHAGEN / TAMI VOGEL / CLAUDIA EGELHOFF

Ovenbirds (left) and Nashville Warblers (right) are common Minnesota collision victims

LIGHTS OUT. Bright lights make beautiful skylines but they can also disorient migrating birds and lead to deadly collisions with buildings. In 2007 an ongoing Lights Out program was established as a core Project BirdSafe program. Lights Out was embraced early by both the Minneapolis and St. Paul Building Owner's and Manager's Associations (BOMA) and had an immediate effect on the Twin Cities skylines.

Lights Out buildings extinguish all possible interior and exterior lighting after midnight during both spring and fall migration. See page 26.

In 2009 the State of Minnesota passed a "Lights Out" law requiring all of the over 5,000 state owned and leased buildings to adhere to our Lights Out criterion in order to save birds and energy.

RESEARCH AND MONITORING. To answer key questions about the numbers and types of birds affected by collisions in Minnesota, Project BirdSafe volunteers monitor specific research routes in downtown Minneapolis, St. Paul and at Rochester's Mayo Clinic for dead and injured birds. These routes, while representing only a tiny subset of Minnesota structures, are designed to sample a variety of dense urban buildings. Findings help researchers to better understand some of the local conditions that contribute to bird collisions.

BIRDSAFE BUILDINGS. Ultimately the work done here and throughout the world to understand and quantify the problem of bird-building collisions must lead to action. Those who design and operate buildings are perfectly positioned to make design decisions that not only save birds day to day but also create markets for bird-safe products.

To increase awareness of bird safety in the architecture and planning community, Audubon Minnesota worked with New York City Audubon to revise these Bird-Safe Building Guidelines for distribution in Minnesota. This publication serves as an important first step towards increasing awareness and adoption of strategies locally to reduce hazards to native and migratory birds using this key migration corridor.

PARTNERS

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DNR Non-game Wildlife Program

National Parks Service

Perkins + Will Minneapolis

St. Paul Audubon Society

Wildlife Rehabilitation Center

Zumbro Valley Audubon Society

Comprehensive Planning for Bird Conservation

OBJECTIVE:
Incorporate bird-friendly policies and activities in design and development of urban spaces. Raise awareness of bird collision issues.

THE INCREASED INTEREST IN BUILDING GREEN creates genuine opportunities to address broader conservation issues in the design and planning of our urban and suburban spaces. A building's effect on the local, regional, national and international environment over its lifetime is reflected in energy and resource use, waste management, daily operations and direct environmental impact. Bird safety is one clear and direct impact that can be creatively addressed through collaborative comprehensive planning.

Birds are an ideal focus of community wide conservation efforts because they are a sentinel of overall environmental health. Stewardship strategies that benefit birds and their habitats also benefit a myriad of other plants and animals. These strategies go beyond those related to buildings and infrastructure just as bird-friendly design includes more than glass and lighting choices.

These Guidelines encourage participation in natural resource-based planning to protect and restore native and migratory bird species of Minnesota. This type of planning benefits communities by emphasizing vital natural assets, involving citizens in natural resource monitoring and helping to prevent unwise patterns of development which lead to disconnected fragments of open space, poor water quality and diminished community character.

Collaboration among diverse disciplines is a valuable and uniquely innovative aspect of sustainable design and development. Such an approach calls upon key participants to work beyond conventional planning and design that relies on the expertise of specialists working in isolation. Through collaboration, participants develop an enhanced understanding of how specialized knowledge can inform the design process. This new insight creates the potential for innovative design solutions to protect natural resources while improving the quality of life for communities.

Key participants in natural resource-based planning include design and engineering professionals, natural science professionals and citizen scientists, government agencies, and advocacy organizations.

Prairie planting at Thomson Reuters

Native plantings at Aveda headquarters reflect corporate commitment to the environment

Renewable energy helps birds

BIRDS AND URBAN PLANNING

The Minnesota Land Planning Act, (Minn. Stat. 473.852.869) requires that communities submit comprehensive plans in accordance with the Metropolitan Planning Council's 2030 Regional Development Framework, which includes protection of natural resources as a primary goal.[12] Native and migratory birds are a valuable natural resource.

Several North American cities have made birds a priority. The City of Chicago has developed a Bird Agenda to showcase, outline and carry forward city-wide initiatives benefiting birds. They have also signed an Urban Conservation Treaty for Migratory Birds with the US Fish & Wildlife Service, an agreement to conserve birds through education and habitat improvement.

The City of Toronto recently made history by being the first city to make it mandatory for all new construction to meet specific standards for bird safety. They have also produced and distributed a book of Bird-Friendly Development Guidelines[13] and undertaken a broad Biodiversity Campaign to educate their citizens about the natural environment in and around Toronto with birds as their initial focus.[14]

There is tremendous potential in our urban centers to make meaningful behavior adjustments to benefit the natural environment. Working collaboratively between specialties and among cities we can create a network of habitat corridors and safe areas for birds to live and breed or to pass through unharmed between summer and wintering grounds. In the process we benefit countless other creatures and ourselves.

Best Practices for Bird Safety

Best Practices included in this section make specific recommendations toward the planning, design, retrofit, and operation of buildings to minimize bird collisions. The strategies included complement the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ as well as the Minnesota Sustainable Building Guidelines (B3-MSBG).

The LEED system is the U.S Green Building Council's nationally accepted standard of sustainability for the commercial, residential, and institutional building industries. Provisions related to bird safety and landscaping are included in the latest version of LEED v3 (2009).

LEED challenges practitioners to assess the impact of building and site development on wildlife, and incorporate measures to reduce threats that buildings pose to birds. Buildings may be certified as silver, gold or platinum according to the number of credits achieved in seven categories:

1. Sustainable Sites (SS)
2. Water Efficiency (WE)
3. Energy and Atmosphere (EA)
4. Materials and Resources (MR)
5. Indoor Environmental Quality (IEQ)
6. Innovation and Design Process (ID)
7. Regional Priority (RP)

Additionally, bird-safe building criteria are planned for inclusion into Minnesota Sustainable Building Guidelines, as part of the Buildings, Benchmarks, and Beyond Program (B3-MSBG) in 2010.[2]

"By improving our cities for birds we enhance our own lives and the strength of our community. Protection of birds in an urban area presents particular challenges that can best be met by developing strong and creative partnerships."

Kent Warden
Executive Director
BOMA Greater Minneapolis

DID YOU KNOW?

If you imagine the most populous North American cities arranged horizontally as a horizon line or "birds-eye view" they cover over 40% of the width of North America. Many cities are concentrated on key migration routes, making them nearly impossible for birds to avoid.[10]

Site and Landscape Design

OBJECTIVE:
Minimize the potential for bird collisions when siting buildings near existing landscape features and when planning new landscapes in close proximity to buildings.

A WELL-INTEGRATED SUSTAINABLE DESIGN enhances open space and protects and restores habitat while enhancing the overall architectural and operational quality of a built facility. Efforts to integrate nature and attract wildlife should be balanced with specific considerations of a site's impact on birds. Birds attracted to on-site habitat are vulnerable to collisions with glass. These guidelines encourage bird-safe design strategies early in the collaborative design process through consideration of site, existing habitat, and bird-safe landscaping.

CONSIDER SITE ANALYSIS

Urban parks attract birds

Analyze the site to determine potential attractions for bird populations.

- Consult with an ecologist or bird specialist to inventory the site.
- Document the location of nearby vegetated streetscapes and urban parks.
- Identify all sources of food and shelter for migratory and resident bird populations, including plants, water and other natural features.
- Identify human-made features that attract birds, including water sources, nesting and perching sites, and shelter from adverse weather.[15]

LEED
Coordinate with LEED Credits
SS 5.1 Site Development: Protect or Restore Habitat

CONSIDER EXISTING HABITAT

Treat windows near habitat

Site building(s) to reduce conflicts with existing and planned landscape features that may attract birds.

- Where buildings cannot be located away from bird sensitive areas, take special care in treating windows. See "Exterior Glass" pages 20-21.
- Where strategic reductions to building footprint have been made in order to enhance vegetated open space and habitat, assess site conflicts and include bird safe treatments.
- Use soil berms, furniture, landscaping, or architectural features to prevent reflection in glazed building facades.

LEED
Coordinate with LEED Credits
SS 5.2 Site Development: Maximize Open Space

WHILE BIRDS COLLIDE WITH BUILDINGS AT ALL LEVELS, ground-level stories are considered the most dangerous because this is where habitat reflections, glazing and internal planting are often all quite prominent. Analysis of bird collision data over 10 years in New York City showed that "most collisions were documented to occur during the day at the lower levels of buildings where large glass exteriors reflected abundant vegetation, or where transparent windows exposed indoor vegetation."[16]

CONSIDER LANDSCAPE PLACEMENT

Dangerous reflections

Birds are vulnerable to collisions nearly anywhere glass occurs. Habitat in proximity to glass exacerbates this threat unless reflections are avoided or eliminated or visual cues are incorporated in glazing.

- When planning new landscapes be aware of reflections and see-through effects created by habitat in relation to building features. Place plantings to minimize these effects.
- Alternatively, situate trees and shrubs immediately adjacent to the exterior glass walls, at a distance of less than three feet from the glass.[17] Close proximity will minimize habitat reflections. In addition, if a bird does try to fly to a reflection at this range, flight momentum will be minimal, thereby reducing fatal collisions. This planting strategy also provides beneficial summertime shading and reduces cooling loads.
- If any bird-attracting features (food, water, shelter) are in reflective range of the building(s), use fritting, shading devices or other techniques to make glass visible. See "Exterior Glass" pages 20-21.

CONSIDER INTERIOR LANDSCAPING

Confusing interior plants

Birds will mistakenly seek shelter in landscaping located behind glass.

- Mask views of interior plantings from outside the building.
- Use screening, window films or treatments to make glass visible.

CONSIDER ROOFTOP LANDSCAPING

With the increased use of green roof technology, impacts on birds must be considered.

- Treat glass to minimize the reflection of rooftop landscaping in adjacent building features.
- Consider foregoing green roof installation or eliminating access to birds if reflection in adjacent buildings will occur.

LEED

Coordinate with LEED Credits
SS 7.1 Heat Island Effect: Non-Roof
SS 7.2 Heat Island Effect: Roof

CANOPY HEIGHT

Glass treatments should be applied to the height of the top of the surrounding tree canopy or the anticipated height of surrounding vegetation at maturity.[13]

Building Layout and Massing

OBJECTIVE:
Include bird-safe strategies as part of an integrated design approach before construction rather than retrofitting a building that proves problematic.

BIRD-SAFE STRATEGIES do not restrict the ability to design creatively. These guidelines encourage an integrated design approach, challenging building designers to include bird-safe strategies to enhance aesthetic, functional, and building performance goals. The layout of individual buildings and their relationship to other structures on the site can affect the number of bird collisions that occur. Building layout and massing can be planned along with landscaping to minimize the likelihood of bird collisions.

CONSIDER SPECIFIC SITE FEATURES

These two birds were fooled by habitat reflections

Clear barriers create a deadly hazard for birds

Ground level stories are the most hazardous areas of all buildings and should be designed to minimize bird collisions.

- Minimize those hazards that bring birds close to buildings such as vegetation, water and other features.
- Provide uniform covering with bird-safe materials, especially adjacent to landscapes. See "Exterior Glass" pages 20-21.
- Use angled glass, between 20 and 40 degrees from vertical, to reflect the ground instead of adjacent habitat or sky.[18]

Clear barriers such as transparent bus-shelters, skyways, linkways, railings, windscreens and noise barriers create a serious hazard for birds because they are invisible, causing a deadly fly-through hazard.

- Avoid use of transparent materials in these structures in any location where birds may be present. Use translucent or decorative glazing as an alternative.
- If clear panels of any kind are in use, incorporate surface treatments to make glass visible. See "Exterior Glass" pages 20-21.

Confusing corners with multiple reflections

Birds can fall through grates after hitting windows

"Bird safety is easier to sell when it overlaps with other green strategies. Slanted glass reduces solar heat gain but also works to effectively reduce bird injuries. Fritted glass reduces heat gain, and if it's 50% you can still see through it."

Jeanne Gang, Studio Gang Architects, Chicago

Courtyards may contain landscaping and confusing internal corners that limit bird escape routes. These areas often allow sudden access by people that flush birds into glass.

- Control access to enclosed areas so birds flush away from glass into open areas.
- Treat glass with bird-safe materials so birds see and avoid glass.

Rooftop obstacles such as antennas and media equipment can injure or kill birds and should be minimized. In poor weather and bright lighting conditions birds may congregate on and around rooftops.

- Co-locate antennas and tall rooftop media equipment to minimize conflicts with birds.
- Utilize self-supporting structures that do not require guy wire supports.
- Avoid up-lighting rooftop antennas and tall equipment, as well as decorative architectural spires. See "Lighting Design" pages 24-25.

Site ventilation grates also present a unexpected danger for birds. An injured bird that falls onto a ventilation grate with large pores can become trapped.

- Specify ventilation grates with a porosity no larger than 0.8 inches.[13] Cover larger grates with netting.
- Never up-light ventilation grates.

Driveways can also cause birds to flush from landscaping into reflective glazing as vehicles approach.

- Ensure routes of escape for birds that are using landscaping along driveways and access roads.
- Take care in routing driveways adjacent to landscaping and reflective glazing.

Exterior Glass

OBJECTIVE:
Prevent bird collisions with glazed surfaces, while maintaining transparency for views, daylighting and passive environmental control.

MOST BIRD COLLISIONS OCCUR at the glazed surfaces of buildings. While circumstances such as lighting and other obstacles do contribute, glass areas are the primary focus of bird-safe design and retrofit strategies regardless of the overall site, landscape, layout and massing features. Bird-friendly glass products can contribute to aesthetics, energy efficiency, and effective daylighting. For bird safety, efforts focus on creating visual markers to make glass visible to birds and minimize reflection of habitat and sky.

CONSIDER VISUAL MARKERS

Interior shades and exterior film at the Minneapolis Central Library

White fritted pattern on glass facade at IAC Offices in New York City

NYC AUDUBON

"Visual noise" is what allows us to see glass. It is created by varying materials, textures, colors, opacity, or other features and helps to break up glass reflections and reduce overall transparency.[19] Creating these visual markers can alert birds to the presence of glass as an obstacle. This is the most effective way to mitigate the danger that glass poses to birds.

- Utilize etching, fritting, translucent and opaque patterned glass to reduce transparency and reflection, while achieving solar shading. (Note: Although fritting is useful for creating visual noise, it is less effective at reducing reflectance since it is generally applied on the interior face of the glass.)
- Incorporate windows with real or applied divided lights to break up large window expanses into smaller subdivisions.
- Consider applying acid-etched or sandblasted patterns to glass on the outside surface to "read" in both transparent and reflective conditions.
- Create patterns that follow the "hand-print" rule (below).
- Use window films featuring artwork or custom patterns permanently or on a rotating basis.
- Low-reflectivity glass has not been sufficiently tested for bird safety but may prove beneficial in certain installations.

DID YOU KNOW?

Studies show that small birds will attempt to fly through any opening larger than 4 inches wide or 2 inches tall or about the size of a child's handprint oriented horizontally. When creating "visual noise" on or around a window, optimal openings are no larger than a small handprint.[19]

CONSIDER INTERIOR AND EXTERIOR TREATMENT

An exterior ceramic framework provides shading and daylighting (New York Times)

Exterior shading or other architectural devices enhance bird safety.

- Utilize shading devices, screens, and other physical barriers to reduce reflectivity and birds' access to glass.
- Incorporate louvers, awnings, sunshades, light shelves or other exterior shading/shielding devices to reduce reflection and give birds a visual indication of a barrier.
- Consider other highly patterned shading/shielding devices that will provide visual cues and encourage bird safety.

Interior window treatments can provide visual cues for birds and reduce both transparency and reflections. They also help reduce light trespass from buildings. See "Building Operations" page 26.

- Design interior window treatments using light-colored solar reflective blinds or curtains. Partially open blinds during the day.
- Close curtains and blinds if evening lighting is utilized.
- For best results, consider photo-sensors, timers and other automatic controls to regulate shading devices, lighting and daylighting.

CONSIDER INTEGRATED DAYLIGHTING

Translucent glass can help balance daylighting and prevent bird collisions

Large expanses of clear exterior glazing do not equate to effective daylighting for buildings. In fact, over-glazing can contribute to glare, veiling reflections, unwanted heat gain, and also bird collisions. Many strategies used to achieve effective daylighting are compatible with bird safety.

- Where appropriate, daylighting strategies such as exterior shading devices, fritted glass, and diffuse and translucent glass can also help to prevent bird collisions.
- In general, the more untreated glass you have, the greater the risk to birds, especially on sites that are in predictable migratory and resident bird areas.

LEED

Coordinate with LEED Credits
EQ 8.1 and 8.2 Daylight & Views
EA 1 Optimize Energy Performance

WINDOW AREA

Windows constitute about 25-40 percent of the wall area of effectively designed daylit buildings, an area very similar to the windowed area in non-daylit buildings.[20]

Emerging Technologies

OBJECTIVE:
Encourage glass manufacturers to advance the search and development of innovative technologies that make glass visible to birds without visually impairing glass for humans.

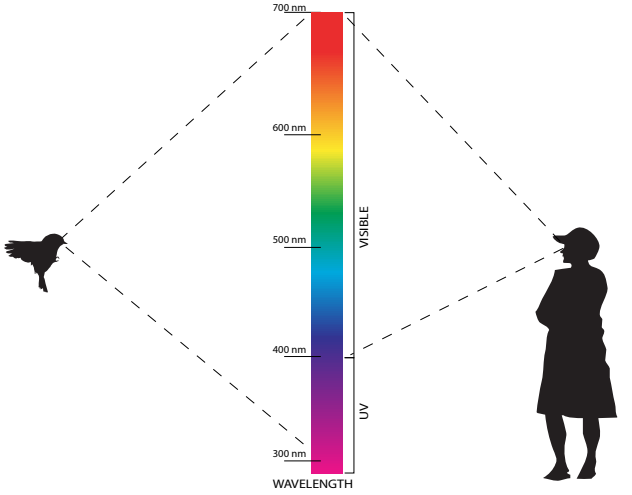
THE ARCHITECTURE AND BUILDING DESIGN INDUSTRY is perhaps best positioned to press for long-term technological solutions for bird-safety. Encouraging a technological solution would stimulate research and development in the glass industry, and encourage wide-ranging innovative product development with beneficial economic consequences.

An innovative technological solution would be widely accepted in the design and construction industry, with beneficial economic consequences, particularly if it minimized aesthetic impacts and was cost-competitive. Developing effective technologies will require commitment of time and resources along with the support and leadership of glass and construction industry officials.

CONSIDER INNOVATION

Bird-safe glass may involve novel uses of known manufacturing processes, new/unexplored technologies or even the use of polycarbonates. Designers and architects can create demand for bird-safe technology that has stalled in development due to an uncertain market for these products.

- Encourage manufacturers to offer "bird-safe" patterns as stock products in a variety of finishes for design flexibility (i.e. ceramic frit, acid etching, laminated LEDs, electrochromic coatings).
- Encourage the development of glass that eliminates reflections. The exterior surface of glass is of primary concern, however all surfaces of glass reflect habitat to some extent.
- Request plastic films, diachronic coatings, and tints for exterior use.
- Utilize existing patterning materials such as ceramic frits and acid etching for exterior use.
- Support research on pattern recognition of both humans and birds to identify patterns that inhibit the fly-through effect while minimally obstructing human views.



NYC AUDUBON

Differences in human and avian vision have inspired one type of bird-visible glass – Ornilux Glass – and much ongoing research

ROBERT BLEIWEISS, PROCEEDINGS OF NATIONAL ACADEMY OF SCIENCES

Human-visible

Bird-visible

DID YOU KNOW?

Unlike humans, birds perceive UV light as a separate color. In fact, many birds have feather patterns that are invisible to humans. These patterns help birds distinguish among species and sexes. UV vision is also important for feeding and for orientation during migration. Glass products that either reflect or absorb UV wavelengths are being tested for bird safety but are not yet readily available.[21]

CONSIDER NEW TECHNOLOGY

CHRISTINE SHEPPARD

Ornilux Glass was recently installed at the Wildlife Conservation Society's Center for Global Conservation in Bronx, New York

The development of an integral glass technology would greatly reduce the problem of building-related bird mortality without imposing major aesthetic modifications to contemporary building designs.

- Develop glass with integral patterns in the ultra-violet range that will be visible to birds and not humans.[21]
- Experiment with particles that can be cast integrally into glass during the production process.
- Encourage the development of other forms of non-reflective tinted or spectrally selective glass.

LEED

Coordinate with LEED Credits
EQ 8.1 and 8.2 Daylight & Views
ID 1 to 1.4 Innovation in Design

Research and New Product Development

The need for readily-available, cost-effective and aesthetically acceptable products that effectively deter birds from windows cannot be overstated. Existing products and strategies, while developed for other purposes, have great bird-safe potential and have, in some cases, been used intentionally as such.

Still there remain few materials specifically developed for this purpose as industry demands have not pushed manufacturers to meaningful action. It is hoped that ongoing research along with collaboration between architects, glass/film manufacturers and bird conservation professionals will yield new products in the near future.

Ornilux Glass (left) is currently the only commercially available glass product being marketed as "bird-friendly." A UV striped pattern on the inside of the glass increases glass visibility for birds while remaining relatively unobtrusive for people.

Many consider UV coated glass and films to be an ideal solution because of their potential to deter birds while leaving the appearance of glass largely unchanged. Recent research by Dr. Daniel Klem of Muhlenberg College explored the use of a window film with alternating UV reflecting and absorbing stripes and found it highly effective as a deterrent to collisions.[22] Ongoing work in Austria by Martin Roessler has focused on finding which patterns, when applied to glass, are most effective in deterring birds while simultaneously requiring the least coverage.[23]

In the end, the development of effective bird-friendly products requires the will on the part of building designers, owners and managers to demand and test new and existing materials in real-life conditions. A number of inspiring case studies exist (see pages 32-36) and ongoing work with glass and film manufacturers may soon yield readily available products that satisfy both birds and people.

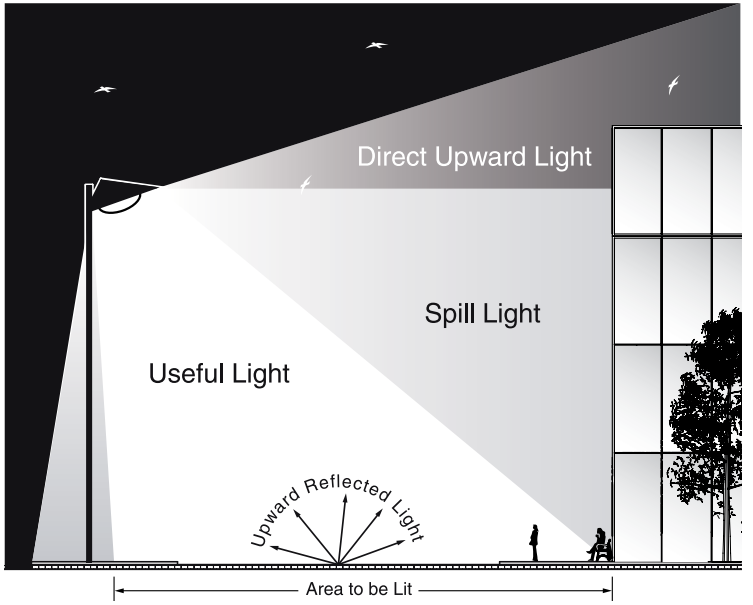
Lighting Design

OBJECTIVE:
Undertake strategies to reduce light trespass from buildings, particularly during migration seasons.

Lighting diagrams courtesy of the City of Toronto

REDUCING EXTERIOR BUILDING AND SITE LIGHTING has been proven effective at reducing nighttime migratory bird collisions and mortality. At the same time, such measures reduce building energy costs and decrease air and light pollution. These guidelines encourage efficient design of lighting systems as well as operational strategies to reduce light trespass from buildings, particularly during migration seasons.

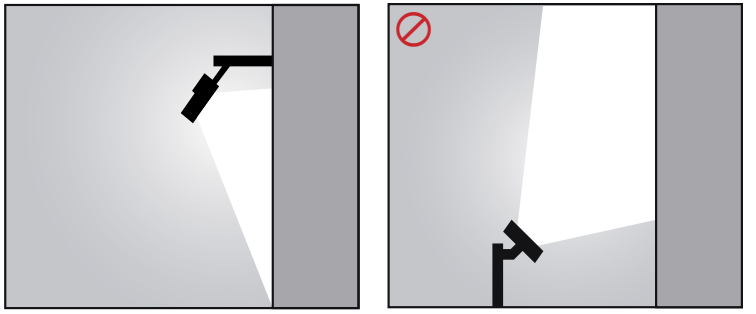
CONSIDER EXTERIOR LIGHT TRESPASS



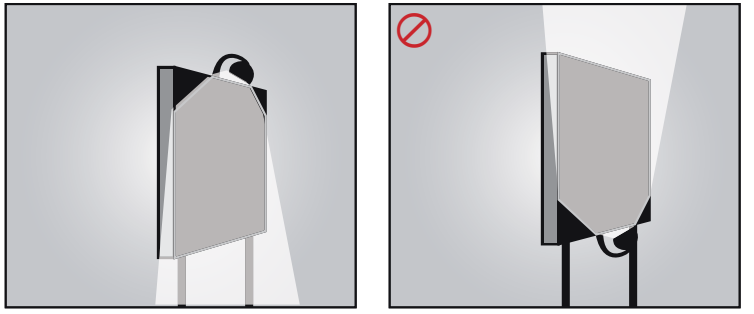
Light pollution is largely a result of inefficient exterior lighting.

- Eliminate light directed upwards by attaching cutoff shields to street-lights and external lights.
- Highlight building features without up-lighting.
- Reduce the amount of light that spills outside areas where it is needed for safety and security.
- Maximize the useful light directed to targeted areas.
- Eliminate the use of spotlights and searchlights during bird migration.

PREFERRED **DISCOURAGED**



Direct exterior lighting downwards and adhere to Lights Out Guidelines

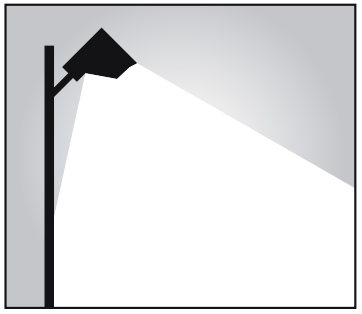


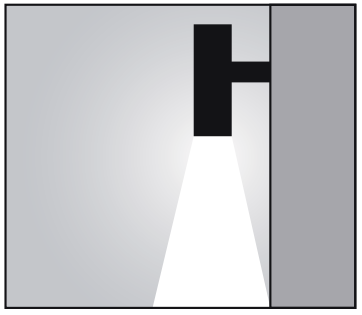
Light advertising from above to reduce the light projected skyward

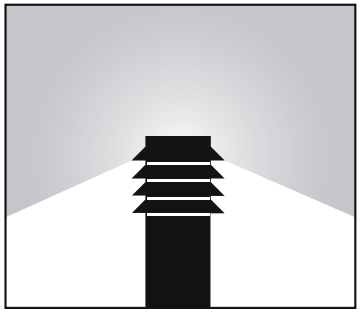
DID YOU KNOW?

Red lights that don't flash are most attractive (and therefore deadly) to birds. Instead, use flashing white or non-flashing blue or green lights.[24]

PREFERRED

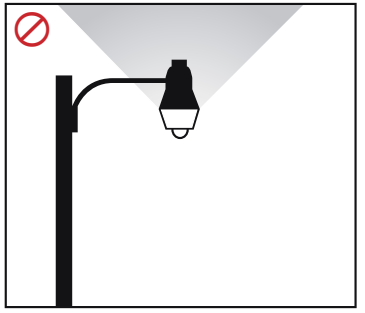


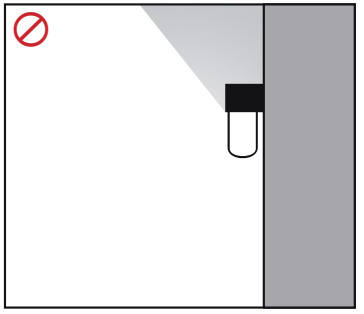


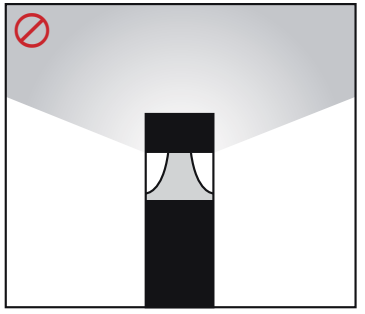


Preferred lighting designs project light downward, reducing waste and light pollution.

DISCOURAGED

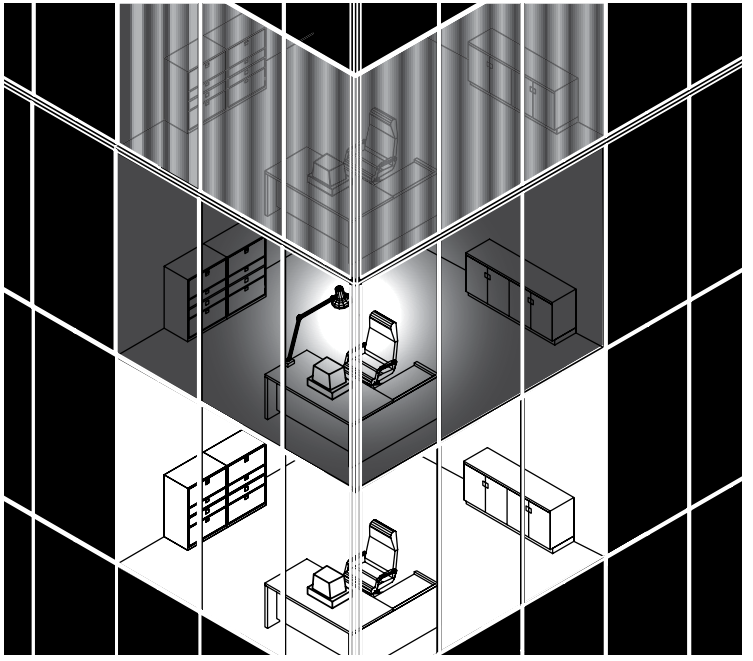






Discouraged lighting designs cause spill light to be directed into the sky where it is not needed.

CONSIDER INTERIOR LIGHT TRESPASS



Light trespass from within buildings can be reduced through design and operational changes.

- Design lights to shut off using automatic controls, including photo-sensors, infrared and motion detectors. These devices generally pay for themselves in energy savings within one year.
- Reduce the need for extensive overhead lighting.
- Encourage the use of localized task lighting and shades.
- Reduce perimeter lighting and/or draw shades wherever possible.

LEED

Coordinate with LEED Credits
SS 8.0 Light Pollution Reduction
EQ 6.1 Controllability of Systems: Lighting
EA 1 Optimize Energy Performance

WASTED LIGHT

Light pollution is largely the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it's not wanted, instead of focusing it downward, where it is.
National Geographic, November 2008

Building Operations

OBJECTIVE:
Further reduce light trespass through operational procedures. Implement monitoring programs to determine bird-collision areas and success of light reduction.

GREAT STRIDES CAN BE MADE to reduce light pollution from buildings during normal building operations. These strategies apply to new and existing buildings and often require the commitment and participation of both building owners and users. In addition, implementing bird-collision monitoring practices will help identify problem areas of a building or site.

CONSIDER DAYTIME CLEANING

Cleaning during normal work hours is becoming more common and can reduce bird mortality and light pollution. Such a schedule reduces energy consumption and enhances security. If cleaning during the day is not an option:

- Complete nightly maintenance activities before midnight or earlier.
- Instruct cleaning crews to work down from the upper stories, turning off lights as they go.

NYC AUDUBON

Clean buildings from the top down

CONSIDER BIRD MONITORING

Implementing daily bird-collision monitoring provides valuable information for science and for prioritizing building retrofits.

- Sweep the building perimeter, setbacks, and roof daily for injured or dead birds.
- Note specific times, dates and locations of birds that are found.
- Work with Project BirdSafe to document all bird deaths and assist injured birds. Most birds are protected by the Migratory Bird Treaty Act of 1918.

NYC AUDUBON

Bird monitoring pinpoints problem areas

CONSIDER LIGHTS OUT

The iconic Wells Fargo building was the first to sign on to Lights Out in Minnesota

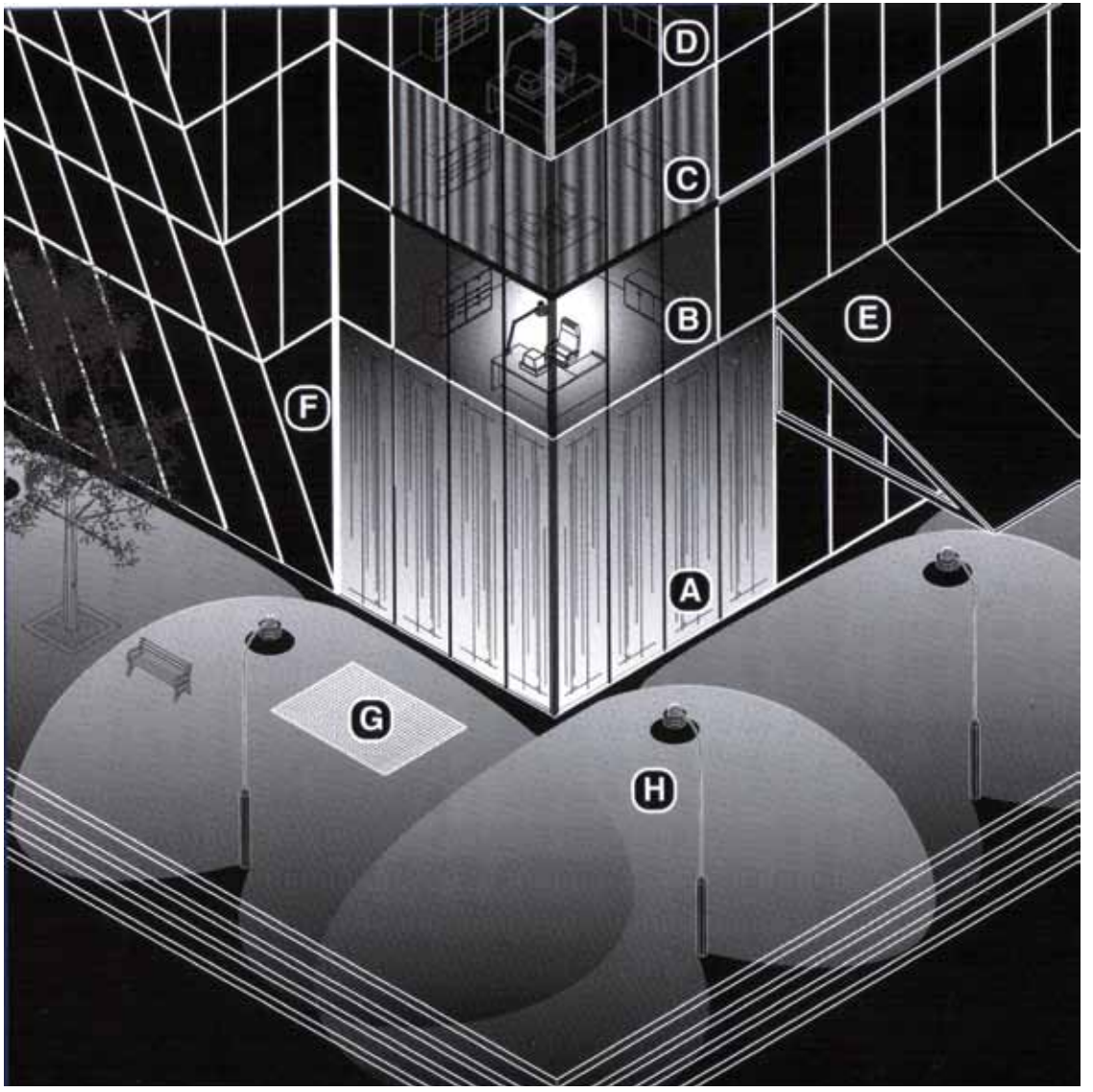
Lights Out programs are city or state-wide initiatives designed to reduce light pollution and bird mortality. In Minnesota, Lights Out is coordinated by Audubon Minnesota's Project BirdSafe using these parameters:

- Building owners and facility managers extinguish all unnecessary exterior and interior lights from at least midnight to dawn especially during bird migration periods:
  - (Spring) March 15 to May 31
  - (Fall) April 15 to August 31
- Priority lights include: exterior architectural lighting; interior lighting especially on upper floors; lobby and atrium lighting.

It is also recommended that building managers work with Project BirdSafe to monitor the effectiveness of Lights Out programs by tracking bird collisions and mortality rates. In addition, tracking light emission reductions and cost savings can provide valuable statistics.

Sign on to Lights Out at mn.audubon.org

Comprehensive Site Strategy



The overall rate of collisions at a given building is based on many variables. Solutions can be implemented at the initial design stage or with modifications or operational changes. The following examples represent a comprehensive bird-friendly site strategy.

A. Treatment applied to glass projecting visual markers to make it visible to birds

B. Task lighting in use after dark

C. Blinds drawn after dark

D. Lights off after work hours

E. Awning blocks reflections on lobby windows from above

F. Glass effectively angled to reduce strike angle and project reflections downward

G. Bird-friendly site ventilation grates

H. Use of lighting fixtures effectively projecting light downward

MIKE LENTZ

Blue-winged Warbler

Modifications to Existing Buildings

OBJECTIVE:
Undertake alterations or retrofits to buildings with high incidence of bird collisions.

IMPLEMENTING BIRD-SAFE STRATEGIES for new buildings provides important opportunities to protect birds through design. However, new buildings represent only a small fraction of those responsible for bird fatalities. Retrofitting existing buildings is an important challenge and opportunity to help reduce bird-building collisions. Systematic site analysis and bird monitoring can dictate priorities for building modifications, programmatic enhancements and landscape adjustments to benefit birds.

CONSIDER YOUR BUILDING AND SITE

Identify problem areas

Specific bird-collision problem areas can be identified and targeted for intervention during routine building maintenance activities.

- Analyze your building facility and site to determine the presence and extent of bird collision hazards. Use checklist at right.
- Integrate bird monitoring efforts with daily maintenance. See "Bird Monitoring" page 26.
- Undertake retrofits and other strategies to reduce bird collisions.
- Continue monitoring building(s) to determine the effectiveness of retrofits in reducing or eliminating bird mortality.

LEED

Coordinate with LEED Credits
EQ 8.1 & 8.2 Daylight & Views
EA 1 Optimize Energy Performance

CHECKLIST OF BIRD COLLISION LIABILITIES

This checklist summarizes conditions that contribute to bird injury and mortality. It may be used towards an initial evaluation of new and existing buildings for potential problems.

Region
- ☐ Within Migratory Route
- ☐ Proximate to Migratory Stopover Destination

Locale
- ☐ Near Attractive Habitat Areas
- ☐ Dense Urban Context (Reduced Sky Visibility)
- ☐ Fog-Prone Area

Site
- ☐ Nearby Trees and Shrubs
- ☐ Adjacent to Grassy Meadows
- ☐ Water Features/Wetlands

Façade Glass Coverage (Overall Percentage)
- ☐ Less than 20%
- ☐ Between 20 and 35%
- ☐ Between 35 and 50%
- ☐ Over 50%

Special Features
- ☐ Unbroken Glass Expanses at Lower Levels
- ☐ Courtyard(s)
- ☐ Transparent Corners
- ☐ Glazed Passageways
- ☐ Glazed Site Dividers/Bus Shelters

Glazing Characteristics
- ☐ Tinted
- ☐ Reflective
- ☐ Mirrored

Dusk and Night-Time Illumination
- ☐ External Facade Up-Lighting
- ☐ Non-Cut-Off Exterior Lighting
- ☐ Spill of Interior Lighting

Other Building Elements
- ☐ Antennae
- ☐ Spires
- ☐ Guy-Wires

CONSIDER MODIFICATIONS

NYC AUDUBON

Window film eliminated collisions in this courtyard at Patuxent Refuge in Maryland

LAURA ERICKSON

Window screening by Birdscreen installed at Rowe Audubon Sanctuary in Nebraska

If monitoring reveals bird collisions, building retrofits usually focus on eliminating reflections and fly-through effects or creating physical barriers. Many design strategies for new buildings and building operational changes (pages 16-26) can be used to improve existing buildings for birds.

Retrofit problematic windows and facades which cause birds to attempt to fly through glass or fly to reflections of habitat or sky. While creating visual barriers for birds, these strategies can simultaneously improve daylighting, save on energy costs, and enhance aesthetics.

- Install transparent or perforated patterned, non-reflective window films that make glass visible to birds.
- Consider painting, etching or temporarily coating collision prone windows to make them visible to birds.
- Add decorative exterior screening and/or solar shading devices, including louvers, awnings, sunshades, and light shelves.
- Consider re-glazing existing windows that experience high rates of bird collisions with translucent, etched, frosted, or fritted glass.
- Consider replacing large existing windows with multiple smaller units, divided lights, translucent, or opaque sections.

Create a physical barrier at notably hazardous windows to deter birds or reduce the momentum of their impact.

- Install netting over problem windows.
- Mount exterior coverings or insect screens.
- Incorporate latticework, artwork, shading or shielding devices outside glass.

Make interior changes to indicate glass barrier or remove attractants.

- Install and operate window blinds, shades, or curtains to hide interior views of plants and hiding places.
- Close curtains or blinds after dark if the interior is illuminated.
- Relocate or shield interior plantings, water sources, and other features that may be contributing to bird collisions.
- Install artwork or screening just inside glass to be clearly visible from outside at all angles.

Dayshift cleaning cost savings are estimated at 4-8% per year. That translates to $145,790 – $291,581 for a building like the IDS Center in Minneapolis or up to $10 million a year if incorporated throughout the city. [25]

CONSIDER OPERATIONAL CHANGES

In addition to incorporating bird monitoring with routine maintenance and security operations, an existing building that is experiencing bird collisions can consider other operational changes.

- Institute the practice of cleaning during the day to reduce light pollution and energy consumption, enhance security, and save money.
- Educate building users about the dangers of light trespass for birds.
- Incorporate lighting design changes to reduce spill light and automate lighting systems.
- Adopt a Lights Out policy for building and site.
- Utilize minimum wattage fixtures to achieve required lighting levels.

CONSIDER LANDSCAPE ENHANCEMENTS

Generally the most effective way to solve bird-collision issues is by dealing with reflective or transparent glass issues as outlined on pages 20-21. Sometimes, it is possible to alter landscaping to improve bird safety at specific sites.

- Consider moving or shielding habitat that is being reflected in windows or is a lure from the other side of clear glass (fly-through effect).
- To address problematic glass windows, consider planting or re-locating trees and shrubs close to the building within a maximum of three feet. This planting strategy can block access to habitat reflections and birds alighting in these trees will not have the distance to build momentum on a flight path towards the glass. Such plantings can also provide beneficial summertime shading and reduce cooling loads.
- Create a green screen for foliage to grow adjacent to building exterior offering shading and visibility to birds.
- See "Site and Landscape Design" pages 16-17.

LEED

Coordinate with LEED Credits
SS 8.0 Light Pollution Reduction
EQ 6.1 Controllability of Systems: Lighting
SS 5.1 Protect or Restore Habitat

CONSIDER PROGRAMMATIC OPPORTUNITES

Community art displays, like this one at St. Paul Travelers, can reduce bird collisions

Creative use of graphics can serve program needs and simultaneously create glazing opacity.

- Utilize decorative window films and banners to announce programs, enhance aesthetics, and display artwork.
- Consider rotating art displays in problematic windows during each migration season or on a more permanent basis. Such displays should create enough visual noise to be seen clearly from outside the glass at all angles.
- Research public art programs in your area as a way of encouraging window art displays.

Hope for the Future

Architects, designers and biologists working together are our best hope for the future

BIRDS HAVE CAPTURED OUR HEARTS throughout history. We are captivated by their songs, their colors and their unlikely feats of endurance during migration. Birds have penetrated our arts, literature and even hijacked our leisure time. And birds are indicators of the state of our world. We all have a stake in their future.

While the challenges we all face in protecting biodiversity seem daunting, solutions abound. With commitment we can halt and reverse the decline of birds and their habitats. Reducing hazards to birds navigating our built environment is one way to make a positive difference. Armed with the knowledge and best practices included in these guidelines, we can incorporate bird-safe strategies in our approach to new construction. And, with examples of other's successes, we can modify existing structures to reduce their toll on birds. In either case we need to take action.

We have great potential in our urban centers to engage people – from residents to community leaders, from students to executives – in making changes that help us all co-exist with nature. Being "green" is now a pervasive desire expressed in our product choices in the store, our design choices in our buildings and in our guiding principles as a culture. Incorporating the needs of birds is a logical progression in our concept of sustainable design and development. Working across disciplines using intellect and creativity can yield untold benefits for people and for birds in the future.

NYC AUDUBON

A polycarbonate core makes this glass visible to birds (IIT Student Center, IL)

LAURA ERICKSON

Warblers like this Chestnut-sided will benefit from our creativity and collaboration

New Construction

MINNEAPOLIS CENTRAL LIBRARY - Minneapolis, MN

▪ Architects: Pelli Clarke Pelli Architects ▪ Landscape design: Coen + Partners ▪ Architectural Alliance

Problem: Reflection

Problem: Transparency

Solution: Visual Noise

Solution: Vegetation near building

The Minneapolis Central Library incorporates bird-safe design techniques in several ways. Its variegated and curtained facade presents an identifiable pattern to birds, while an indigenous shale and birch garden at the building's north perimeter filters views to and from the main level reading rooms. This technique of planting very close to a building facade, in addition to providing shade, prevents incidents of fatal bird strike. Birds cannot see reflections cast upon the glass and are less likely to develop fatally high speed collision rates due to the close proximity of planting to glass. The Library's central atrium features angled glass, a dramatic architectural feature that also greatly eliminates reflections of habitat and sky from most angles. The likelihood of fatal collisions at this angle is also greatly reduced.

AQUA TOWER - Chicago, IL

▪ Architects: Studio Gang Architects

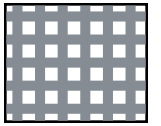
STUDIO GANG ARCHITECTS

The Aqua Tower is a new Chicago landmark and the winner of the 2009 Emporis Skyscraper Award for high-rise architecture. This 82-story residential and commercial tower is a departure from the modern sheer glass skyscraper, incorporating an undulating pattern of exterior terraces which create an organic façade. Architect Jeanne Gang and her team not only aspired to create the natural look of eroded cliffs with the wavering terraces, they also convinced the developer to use fritted glass with a grey dot pattern and picketed railings on the balconies, all to enhance bird-safety. Gang has long been an advocate of bird-safe design and has incorporated bird-safe strategies in a number of her projects.

studiogang.net

Problem: Reflection

Problem: Transparency



Solution: Screen / scrim / fritting

Solution: Visual Noise

SWARTHMORE COLLEGE UNIFIED SCIENCE CENTER - Swathmore, PA

▪ Architects: Helfand Architecture and Einhorn Yaffee Prescott ▪ Landscape design: Gladnick Wright Salameda; ML Baird & Co.

BIRDSANDBUILDINGS.ORG

This renovation and 75,000 square foot addition to an existing science facility was planned to create a series of outdoor courtyards that took advantage of the site's beneficial topography and mature trees. Sensitive to the liabilities of extensive glazing placed near attractive landscapes, the College and its architect consulted ornithologist Daniel Klem who proposed patterning portions of the glass at potential collision "hot spots." After testing several configurations, the designers decided to use a glass with a ceramic frit matrix at locations deemed susceptible to bird collision. Swarthmore engineering professor Carr Everbach designed a "thump sensor" webcam for installation next to windows to detect bird collisions. According to Klem, collisions have been reduced significantly to a mere one or two a year, giving Swarthmore confidence to extend the treatment to other campus buildings.

archnewsnow.com/features/Feature171.htm

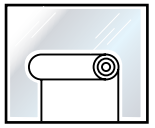
Retrofitting Existing Buildings

TOWN OF MARKHAM – Markham, Ontario, Canada

▪ The Convenience Group ▪ The Fatal Light Awareness Program (FLAP)

Problem: Reflection

Problem: Transparency



Solution: Use of plastic films, diachroic coatings and tints on facade

FLAP

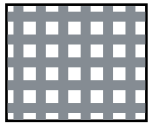
This Town building with reflective glass and a solarium entrance has long been a site of bird strikes. The environment is one of six strategic goals for Markham Council. One of the town Councilors, Valerie Burke, championed bird-friendly buildings and design as an integral aspect of the environment. Town staff worked with FLAP and The Convenience Group to develop and apply a patterned window film to address the bird collision problem.

This is the first application of a bird-friendly window film on a municipal building in the Greater Toronto Area. Initial results indicate the film is very effective in eliminating collisions. This application could serve as a highly influential tool for convincing building managers and governments at all levels to make their structures bird-friendly.

flap.org/markham.htm

CUSANO ENVIRONMENTAL EDUCATION CENTER – Philadelphia, PA - John Heinz National Wildlife Refuge

Problem: Reflection



Solution: Screen / scrim / fritting / net

BILL BUCHANAN

This green building demonstration project, completed in 2001, was built adjacent to a wetland. Its glazed elevations, while affording intimate views of the natural surrounding, caused bird fatalities. The problem was successfully remedied through a partial retrofit with fine netting.

MORGAN MAIL – Manhattan, NY

▪ SurfaceCare ▪ New York City Audubon

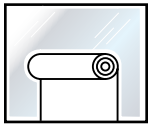
NYC AUDUBON

New York City Audubon's Project Safe Flight volunteers identified the six-story Morgan Mail Processing Facility as a high-collision site. The building had a full city block of black reflective spandrel panels facing a park. Birds in the park were hitting the building because of the habitat they saw reflected in Morgan Mail's façade. Alerted to NYC Audubon's mortality findings, postal officials worked with SurfaceCare to resolve this problem. They applied a vinyl black matte signage film to the exterior on all 440 (8' by 5') panels of glass (left, during installation). The solution was a success and the building went from being one of New York's deadliest buildings for birds to one of its safest.

nycaudubon.org

surfacecareusa.com

Problem: Reflection



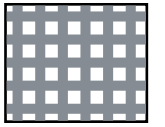
Solution: Use of plastic films, diachroic coatings and tints on facade

ADLER PLANETARIUM – Chicago, IL

BIRDSANDBUILDINGS.ORG

This glass pavilion positioned directly adjacent to Lake Michigan encloses the Adler Planetarium's exit stair. Noting that it was causing bird death and injury, the Museum maintenance staff sought to address the problem first through the application of traditional bird decals. When that solution proved ineffective, they subsequently upgraded to this painted striping system for the glass fronting the lake, which has largely solved the problem.

Problem: Transparency



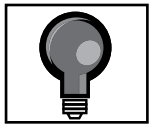
Solution: Screen / scrim / fritting

Building Operations

HEALTHPARTNERS – Bloomington, MN

Problem: Beacon effect, illumination

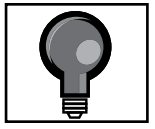
Problem: Reflection



Solution: Lights out

HealthPartners signed on to participate in the Lights Out program in Minnesota as soon as they heard about it in the local media. They embraced Lights Out and incorporated it along with other facility-wide energy saving measures. Because they are a healthcare company and house a department of 24 hour on-call phone agents, HealthPartners did have certain interior lights in use all night long. In response, the company moved those employees to the lower level of the building and into the interior in order to allow the perimeter lights to be extinguished at night. HealthPartners has also hosted an informational session about birds for their employees and monitors the building for birds. In fact, they have made bird monitoring part of their landscaping contract and work with Project BirdSafe to document and take care of any birds they find.

Problem: Beacon effect, illumination



Solution: Lights out

STATE OF MINNESOTA – Lights Out Law

In May 2009 the State of Minnesota passed legislation requiring occupants of state-owned or state-leased buildings to attempt to reduce dangers posed to migrating birds by turning off unnecessary lights between March 15 to May 31 and August 15 to October 31 from midnight to dawn. The law allows the Commissioner of Administration to adopt policies for the practical implementation of this law for prisons and other facilities that depend upon night lighting. The Lights Out law was sponsored by State Representative Phyllis Kahn (DFL – Minneapolis) and inspired by Audubon Minnesota's Lights Out program.

Chapter 101, Article 2, Section 54 [16B.2421] BIRD-SAFE BUILDINGS

HENNEPIN COUNTY – Dayshift cleaning

Starting in March 2010 about half of Hennepin County Minnesota's 63 buildings transitioned to day shift cleaning to save on electricity, heating and cooling costs. Savings are expected to be at least $100,000 annually. With this move, Hennepin County joined a trend that has been popular in the private sector for some time. While day-shift cleaning is generally initiated as a cost-savings measure, it has many other positive side-effects for workers and for the environment. The reduction in greenhouse gas emissions and decrease in light pollution from interior lights make daytime cleaning a very positive move for the birds.

bluegreenalliance.org/press_room/press_releases?id=0064

Products and Innovations


JIM WILLIAMS

Tennessee Warbler

While product innovations continue to emerge, many currently available products have potential bird-safety features even if they were developed for other purposes such as balanced daylighting, innovative aesthetics, building safety and security, and energy efficiency.

The following material sources may contribute to bird safety for new or existing buildings. Products and manufacturers listed below are for information only, and are neither recommended nor endorsed by Audubon Minnesota and its Project BirdSafe partners.

Translucent and Decorative Glazing:

3Form (3-form.com)

Bendheim (bendheim.com)

Cabont Nanogel/Aerogel (cabot-corp.com)

Goldray Industries (goldrayindustries.com)

Kalwall (kalwall.com)

Major Industries (majorskylights.com)

Schott (us.schott.com)

TG P/Pilkington Profilit (tgpamerica.com)

Viracon (viracon.com)

Decorative Ceramic Fritting:

Goldray Industries (goldrayindustries.com)

Oldcastle Glass (oldcastleglass.com)

Viracon (www.viracon.com)

PPG Industries (ppg.com)

Applied Window Films and Spectrally Selective Glass:

Arnold Glas, Ornilux (glaswerke-arnold.de)

Collidescape (fetchgraphics.com)

Solutia / CPFilms Inc. (cpfilms.com)

SurfaceCare USA (surfacecareusa.com)

The Convenience Group (conveniencegroup.com)

U.S. Dept. of Energy (eere.energy.gov)

Electrochromic Glass:

Sage Electrochromics Inc. (sage-ec.com)

Smart Glass International (smartglassinternational.com)

Architectural Metal Mesh:

Cambridge Architectural (cambridgearchitectural.com)

GKD Metal Fabrics (gkdmetalfabrics.com)

Johnson Screens (johnsonscreens.com)

Building-Integrated Photovoltaics:

PowerFilm (powerfilmsolar.com)

Uni-Solar (www.uni-solar.com)

ARCH Aluminum and Glass (archaluminum.net)

Exterior Louvers and Sunscreens:

Hunter Douglas Contract (hunterdouglascontract.com)

Industrial Louvers Inc. (www.industriallouvers.com)

Nysan Shading Systems (nysan.com)

Savannah Trims (suncontrolers.com)

Façade-Integrated LEDs:

Cambridge Architectural (cambridgearchitectural.com)

GKD Metal Fabrics (gkdmetalfabrics.com)

Schott (us.schott.com)

Window Treatments and Banners:

Banner Creations (bannercreations.com)

Biographix (rainierdisplays.com/biographix.html)

Exterior Coverings, Nettings, Screening:

Bird-B-Gone (birdbgone.com)

Nixalite bird exclusion netting (nixalite.com)

StealthNet (birdbarrier.com)

TopRite Netting (cutlersupply.com)

Local Resources


REBECCA FIELD


JIM WILLIAMS


REBECCA FIELD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Local organizations, programs and citizens track bird populations and protect bird species like the Ovenbird, Eastern Bluebird, Baltimore Oriole, Ruby-throated Hummingbird, and White-throated Sparrow

IN MINNESOTA a variety of organizations have established programs related to bird-collision monitoring, bird counting, population mapping and identification of key habitat including Important Bird Areas. Data from these programs can be used in developing natural resources inventories for development projects. Corporations can also get involved in these efforts as a contribution to their community and for the enrichment of their employees.

- **Bird Collision Monitoring:** Project BirdSafe volunteers conduct surveys daily during migration along established research routes. Surveys can also be started at any interested building in conjunction with the project. Surveys involve collection of injured and dead birds resulting from building collisions in accordance with established bird monitoring protocols. Visit mn.audubon.org/birds-science-education/project-birdsafe
- **Important Bird Areas (IBA)**: This international conservation effort identifies, designates, monitors and conserves the most valuable habitats for birds. An Important Bird Area (IBA) is a site that provides essential habitat for breeding, wintering, and migrating bird species. In Minnesota the IBA program is a joint effort between Audubon Minnesota and the Minnesota DNR Non-game Wildlife program. Visit mn.audubon.org/birds-science-education/important-bird-areas or www.dnr.state.mn.us/iba/
- **Christmas Bird Count (CBC):** This one-day annual event has been conducted for over a century. The CBC database contains more than 100 years of data on winter bird populations across the Americas. In Minnesota the Christmas Bird Count is done in partnership with the Minnesota Ornithologists' Union. Visit moumn.org/CBC/
- **Minnesota Breeding Bird Atlas:** Starting in April 2009, volunteers began documenting evidence of breeding birds throughout the state. The project will continue through the summer of 2013 and will result in a detailed atlas of all breeding bird species in the state. The presence and abundance of birds provides valuable information about the health of our environment. This atlas will be an important baseline for future surveys. Visit mnbba.org.
- **The Wildlife Rehabilitation Center** (wrcmn.org) and **The Raptor Center at the University of Minnesota** (raptor.cvm.umn.edu) provide emergency medical care for injured birds and animals from all over Minnesota.
- **The Red-Headed Woodpecker Recovery Project** (redheadrecovery.org), **Minnesota Purple Martin Conservation Project** (mnmartin.org) and **Bluebird Recovery Program** (bbrp.org) are species-specific conservation programs that may be applicable to corporate campuses in the appropriate habitats.
- **Great Backyard Bird Count:** This annual Presidents' Day Weekend event is an opportunity for volunteers to count the birds in their backyards and beyond. Visit birdsource.org/gbbc.

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9. International Dark-Sky Association Newsletter Issue #67. (2006). The Cost of Light Pollution. data.nextrionet.com/site/idsa/nl67.pdf
10. Ogden, Lesley J. Evans. (1996). Collision Course: the Hazards of Lighted Structures and Windows to Migrating Birds. Published by World Wildlife Fund Canada and the Fatal Light Awareness Program. flap.org/new/ccourse.pdf
11. The world's tallest structure is the 2,720 ft. tall Burj Khalifa in Dubai, United Arab Emirates which opened 4 January 2010. It is taller than any other man-made structure ever built. The two tallest buildings in the USA are the Willis Tower in Chicago (formerly Sears Tower) at 1450 ft and the Empire State Building in New York City at 1250 ft. The tallest Minnesota building is the IDS Tower at 792 ft. en.wikipedia.org/
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Online Resources

The American Bird Conservancy (abcbirds.org)

Birds & Buildings Forum (birdsandbuildings.org)

Chicago Audubon (lightsout.audubon.org)

Chicago Bird Collision Monitors (birdmonitors.net)

The Fatal Light Awareness Program (flap.org)

Muhlenberg College – Acopian Center for Ornithology (aco.muhlenberg.edu/aco.htm)

New York City Audubon (nycaudubon.org)

JIM WILLIAMS

Black and White Warbler

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