



DoD Environmental Planning and Conservation Webinar Series



Nexus between Energy Conservation, Light Reduction, and Reducing Bird Collisions with Structures

Eric Kershner, Jo Anna Lutmerding, and Joelle Gehring, U.S. Fish and Wildlife Service;
and Trish Cutler, U.S. Army

April 25, 2023

Please mute your phones



Audio Dial-In: 410-874-6749

Participant Code: 204-527-527#

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Twitter: @DoDNatRes



Nexus between Energy Conservation, Light Reduction, and Reducing Bird Collisions with Structures

April 25, 3:00PM ET.

Migratory Bird Program – *Conserving America's Birds*

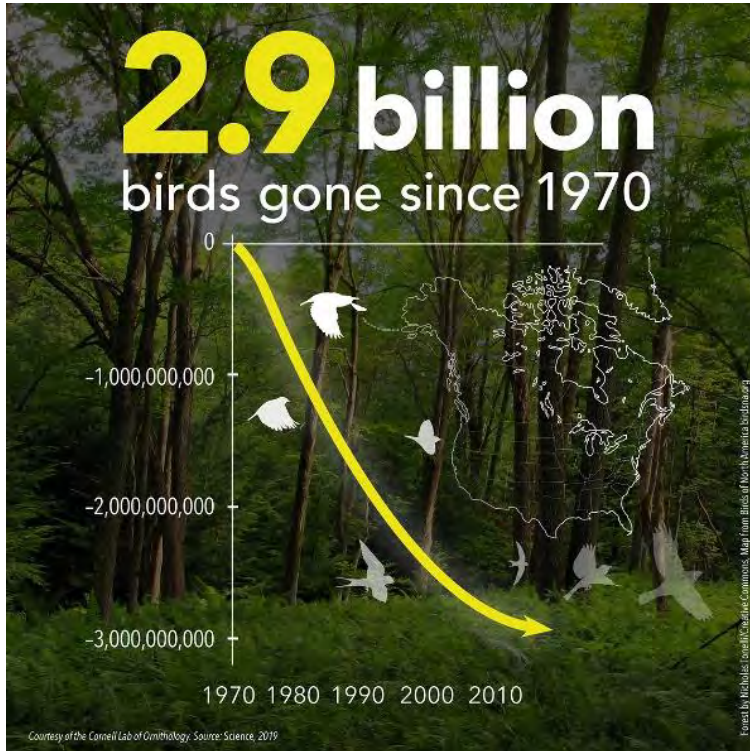
Value of the night sky

The night sky
connects people
across time and
space





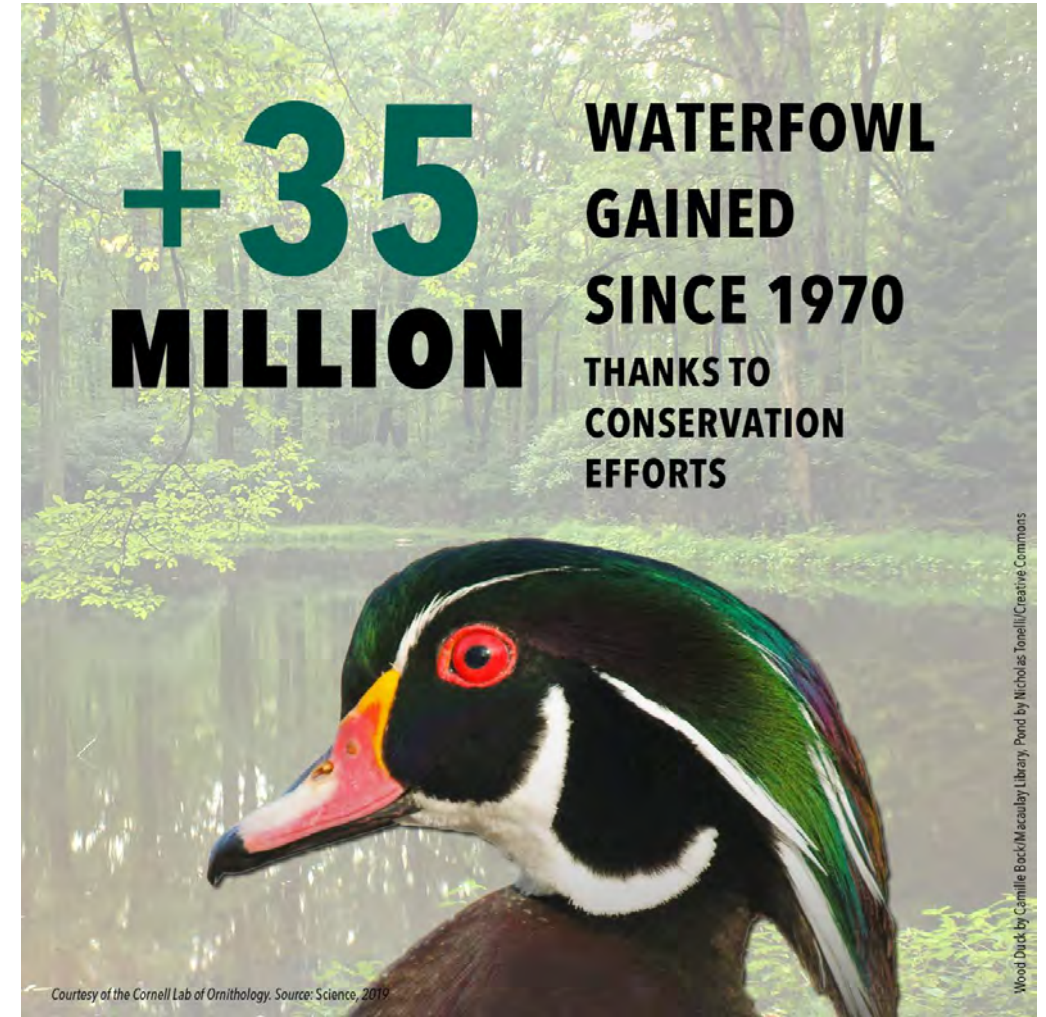
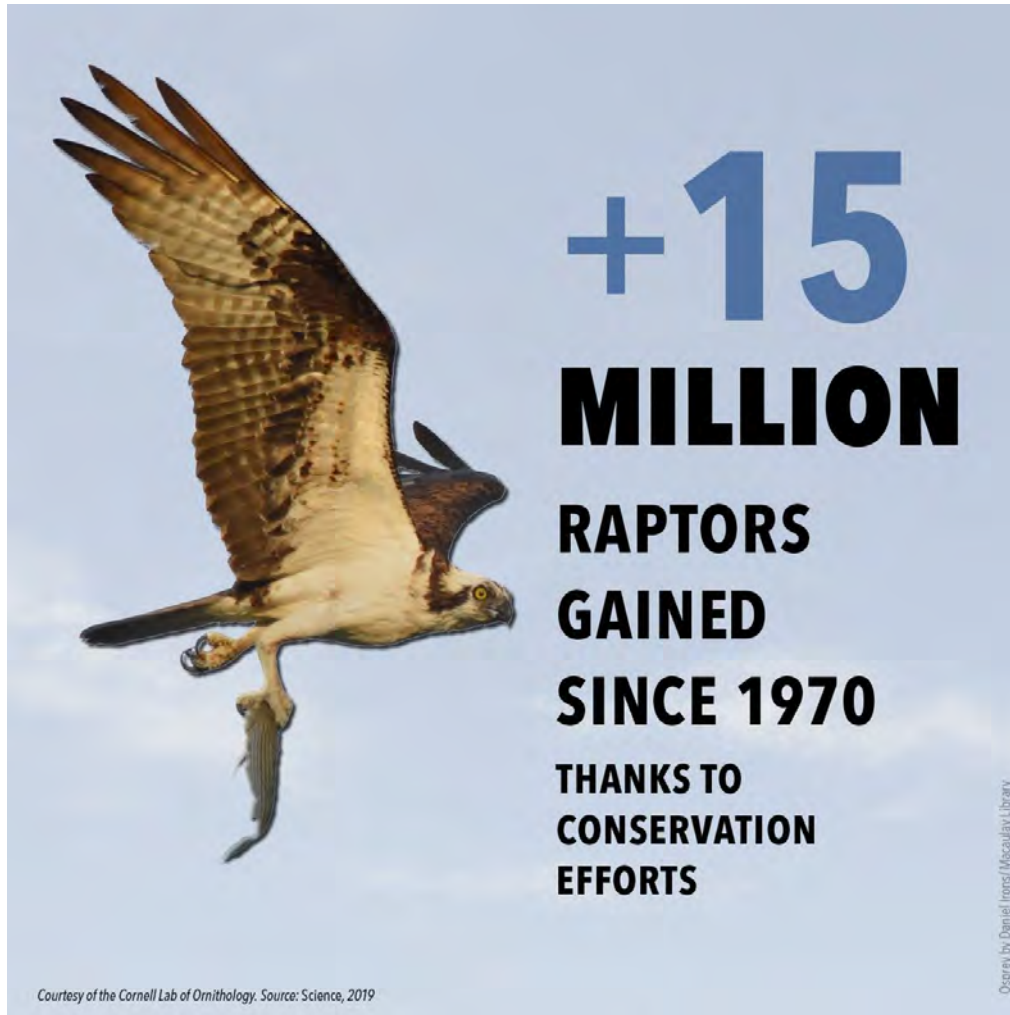
Recovering Three Billion Birds



Rosenberg et al. Science 2019

Migratory Bird Program - Conserving America's Birds

Reasons for Optimism



Rosenberg et al. Science 2019

Migratory Bird Program - Conserving America's Birds

Glass collisions kill almost 1 billion birds per year

>99% of collisions at homes and low-rise buildings



Why do birds collide with glass?

- Birds do not see clear or reflective glass
- Reflections create illusion of habitat or open sky
- Birds are attracted to lights



P. Saenger

Daytime vs. Night



- Daytime collisions – reflections, attraction to interior plants, or flight paths
- Nighttime collisions – attracted to and disoriented by lights





Value of the night sky

The night sky
supports healthy,
natural ecological
functioning



Our future is bright

- Nighttime lighting is increasing 9% each year globally
- >80% of people live under a lit sky

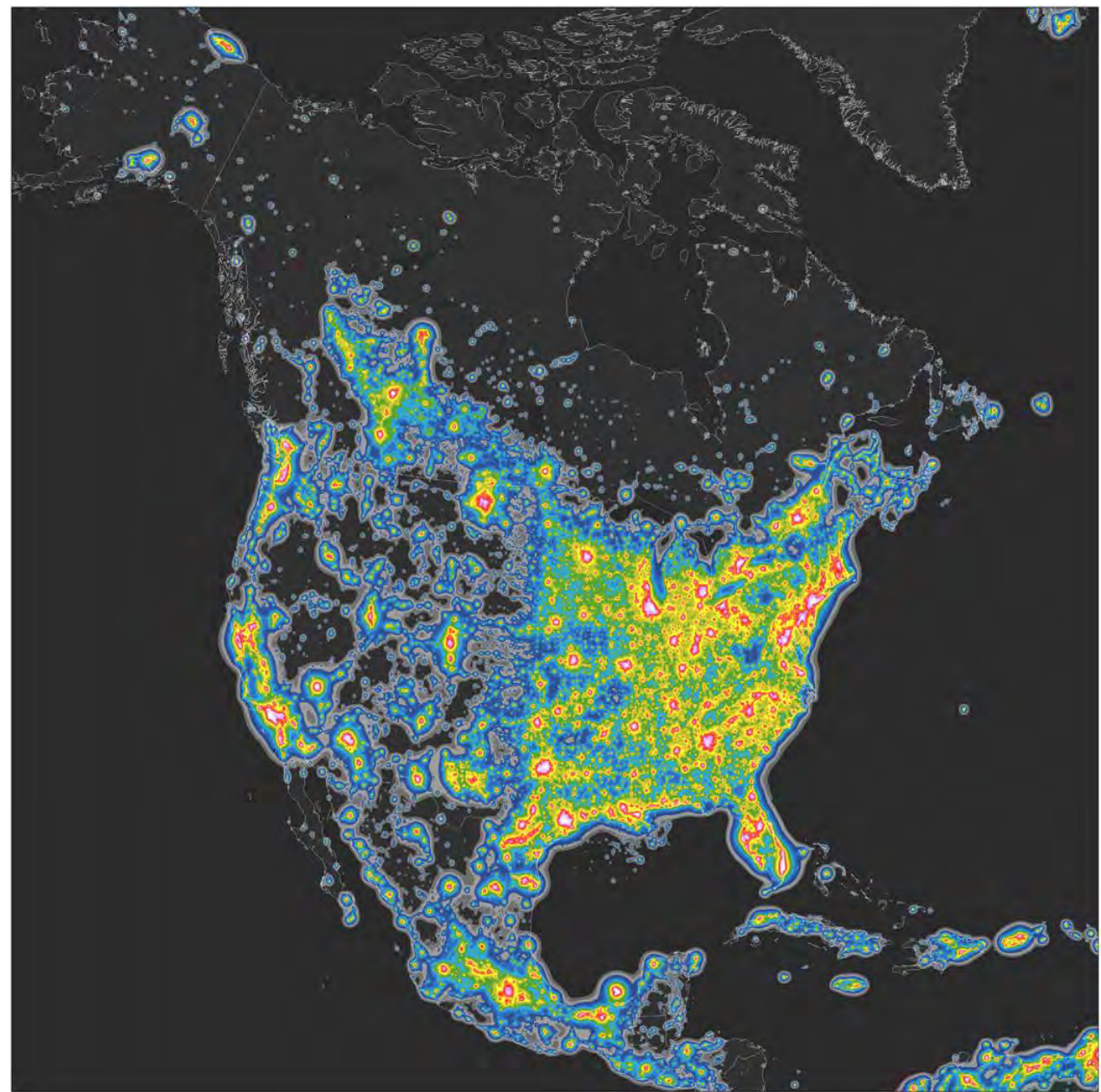


Protected Areas

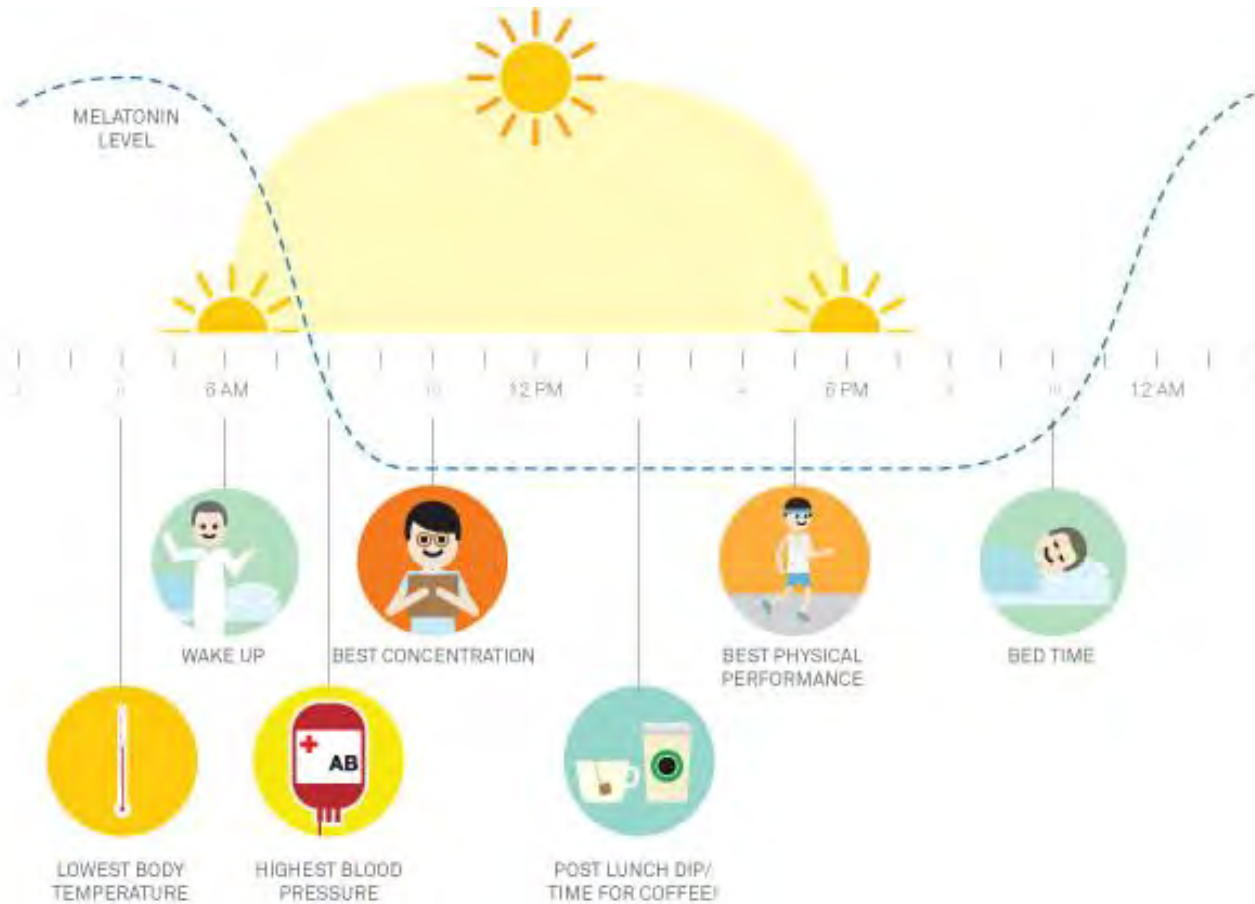
<1/3 Key Biodiversity Areas have
pristine skies globally

Almost ½ of the U.S. has light pollution

Nearly every National Park in the U.S.
has light pollution



Effects of Nighttime Lighting on People

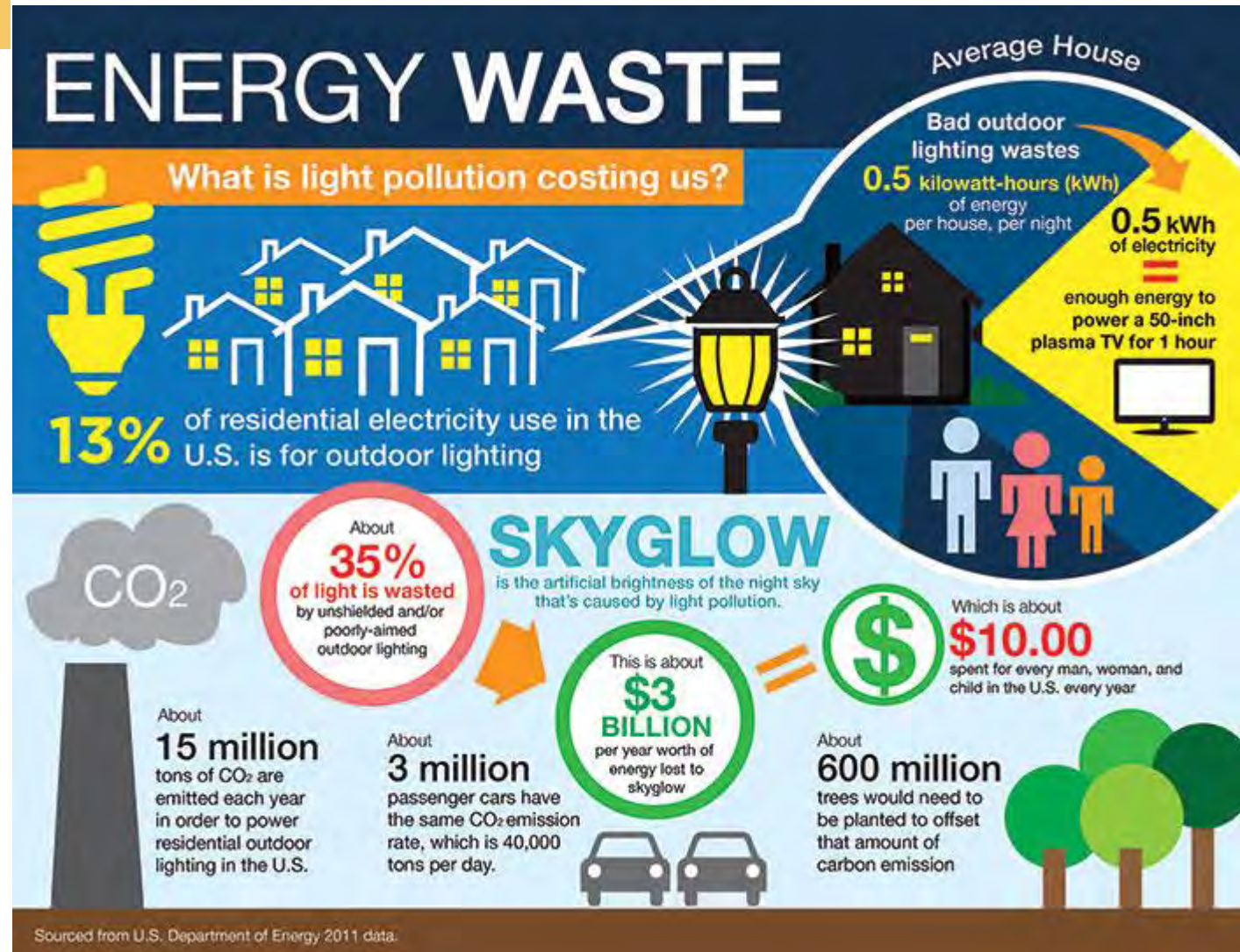


Nighttime Lighting and Safety and Security

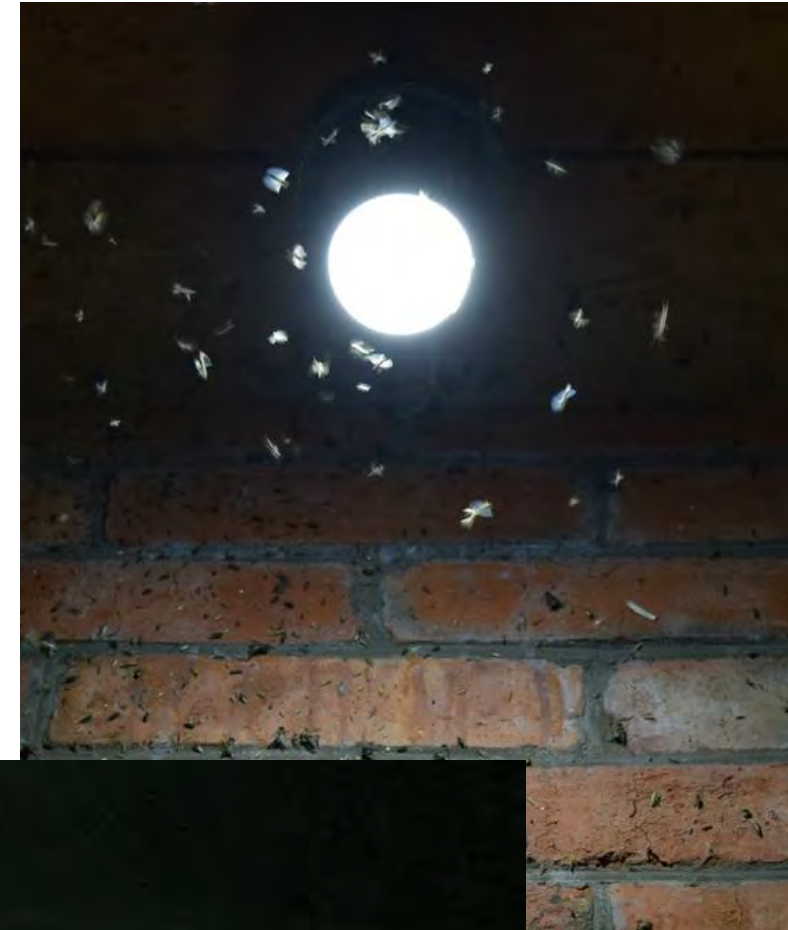
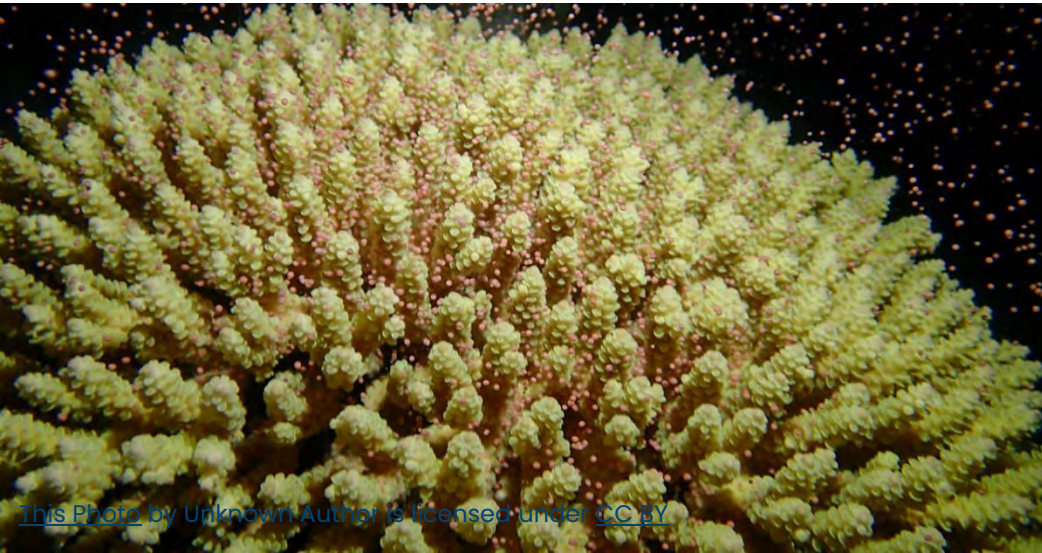
- Glare and reduced visibility
- False sense of security



Nighttime Lighting, Energy, and Emissions



Effects of ALAN on wildlife





All bird species

19%

Migratory

North American
bird species

70%

Migratory

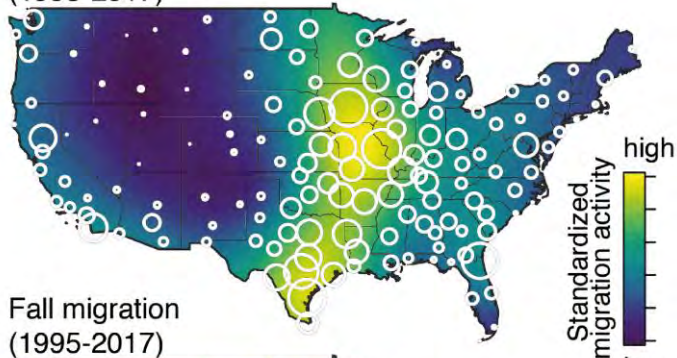
North American
migratory birds

80%

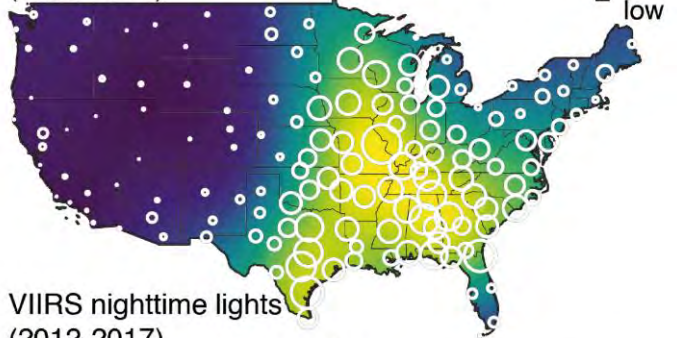
Migrate at night

Effects of ALAN on birds

(a) Spring migration (1995-2017)



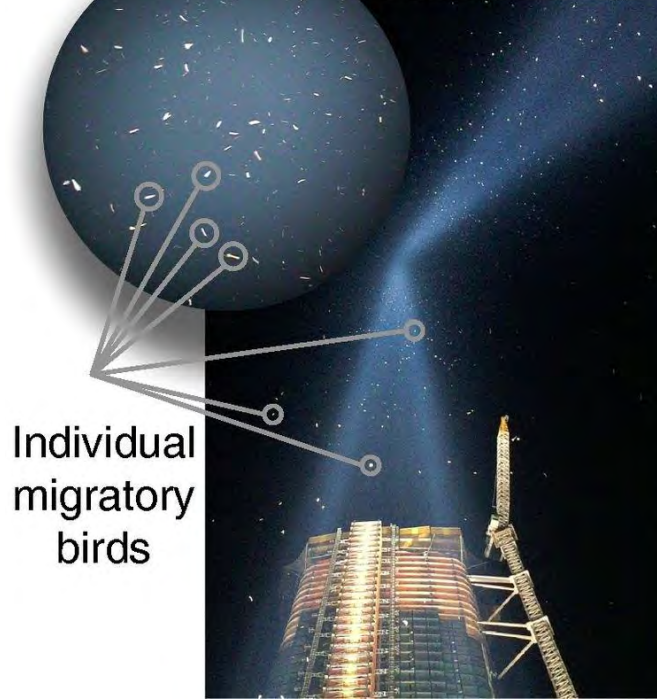
(b) Fall migration (1995-2017)



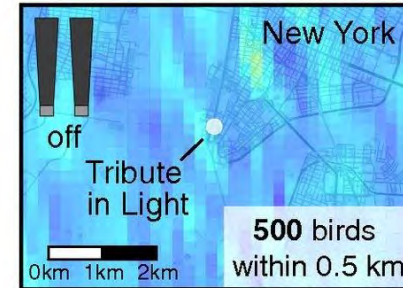
(c) VIIRS nighttime lights (2012-2017)



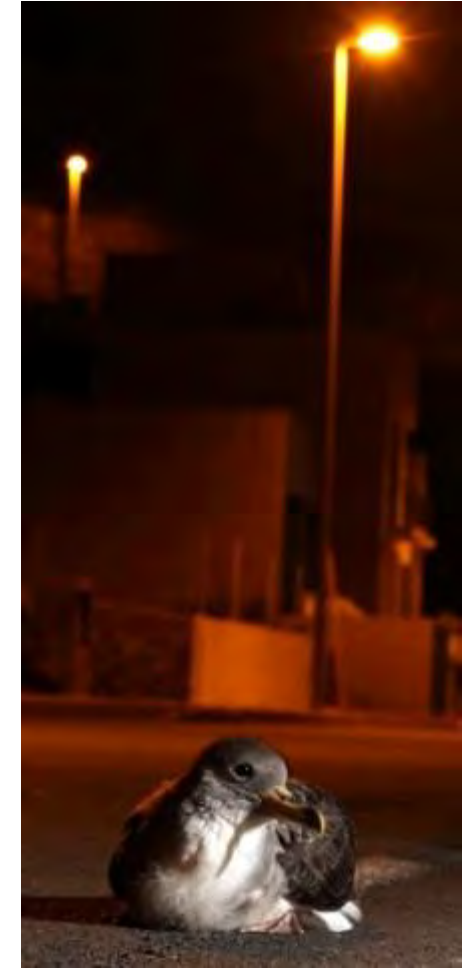
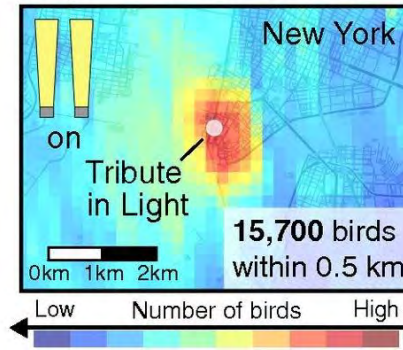
A Tribute in Light



B Sept 12, 2015 02:12



C Sept 12, 2015 02:32



© Airam Rodríguez



Horton et al. 2019

Van Doren et al. 2017

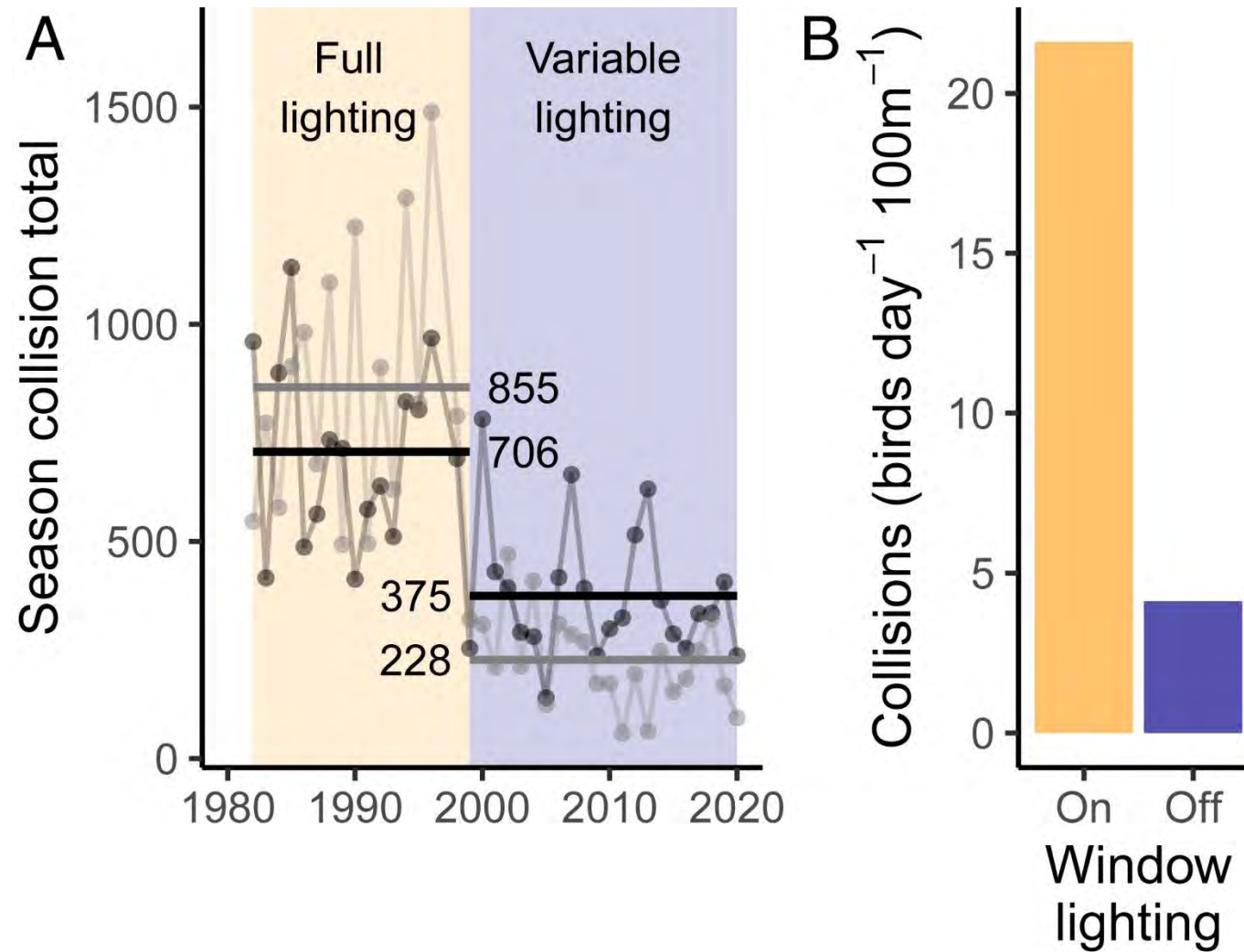
Light and window collisions



Van Doren et al. 2021



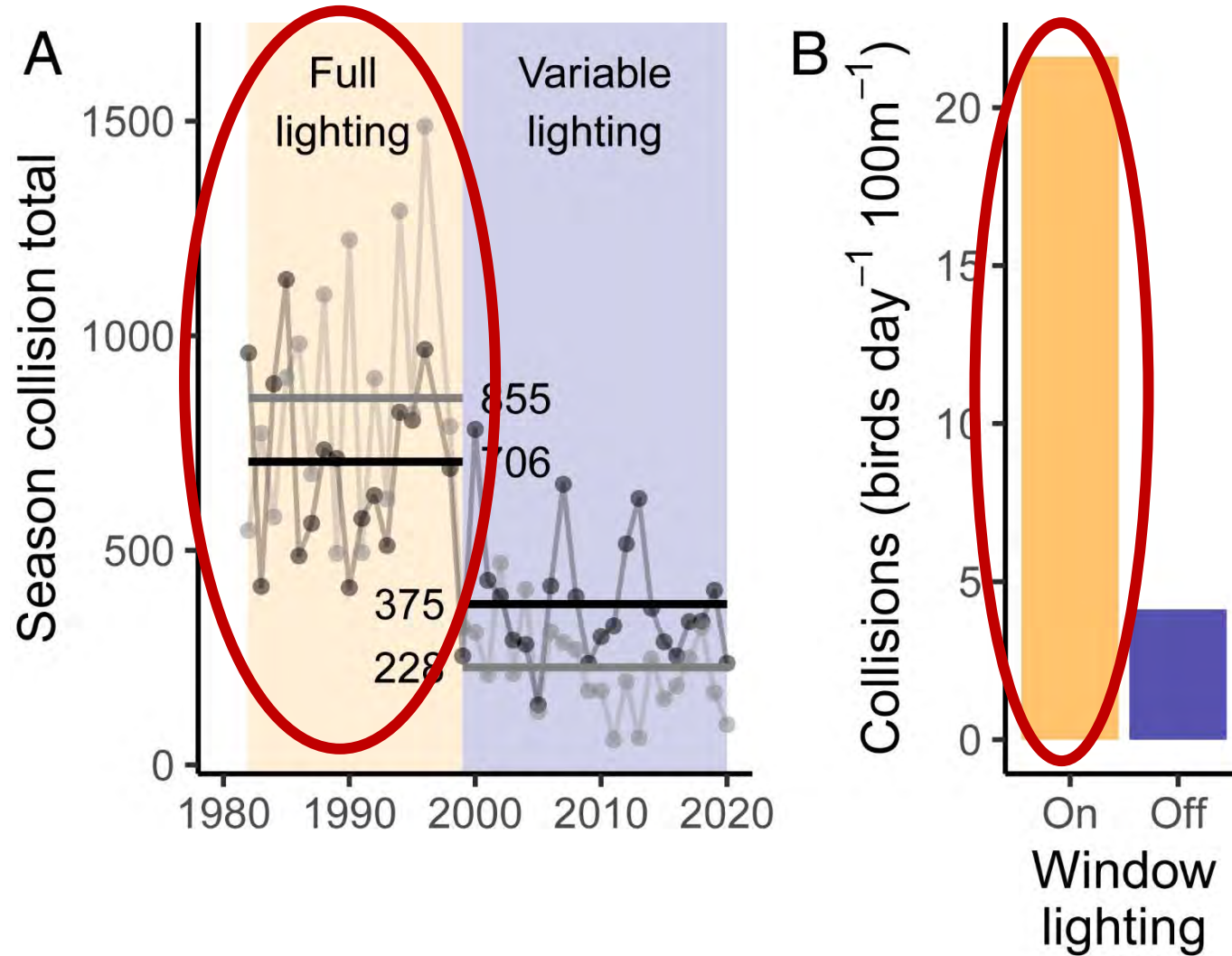
Light and window collisions



Van Doren et al. 2021



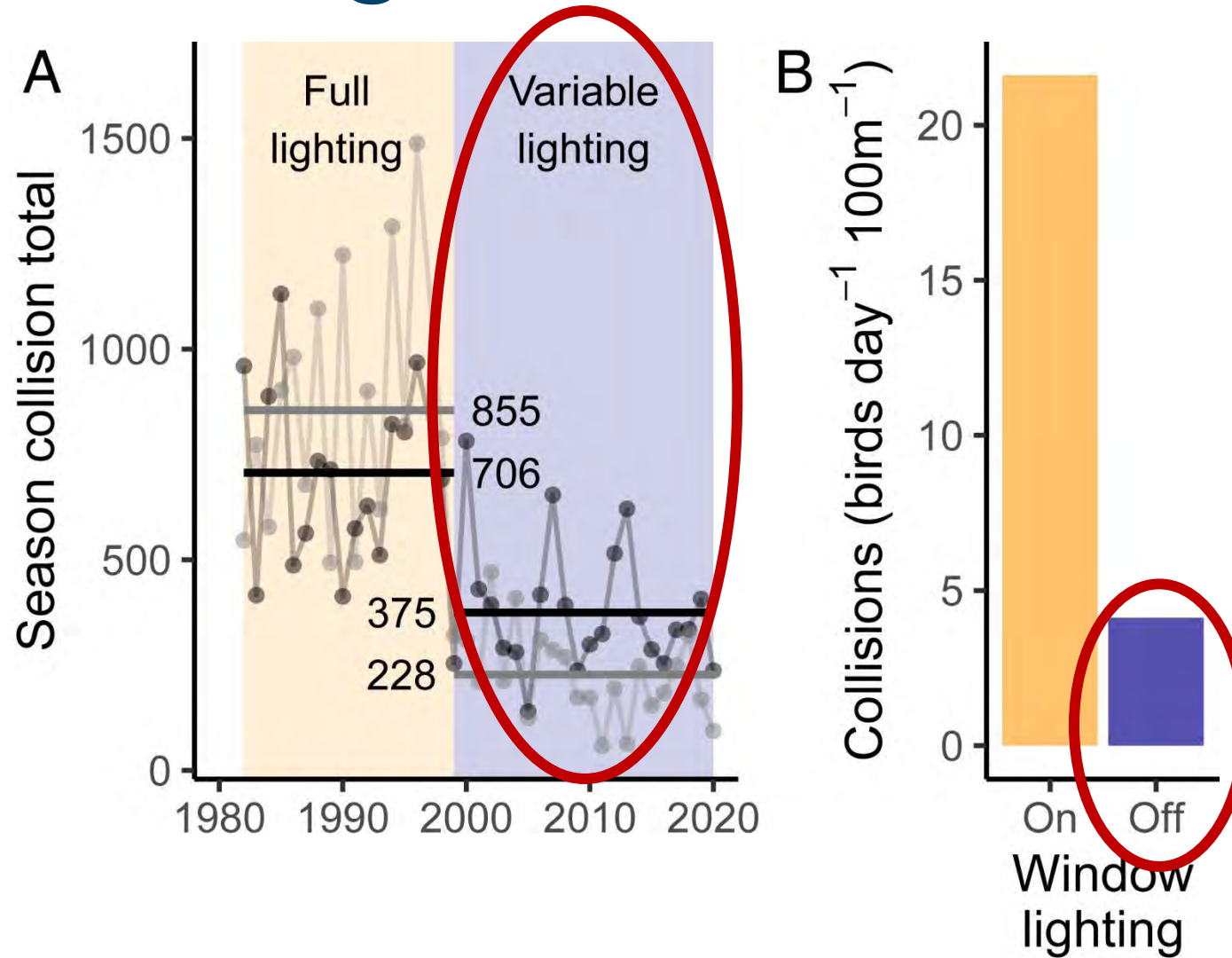
Light and window collisions



Van Doren et al. 2021



Light and window collisions



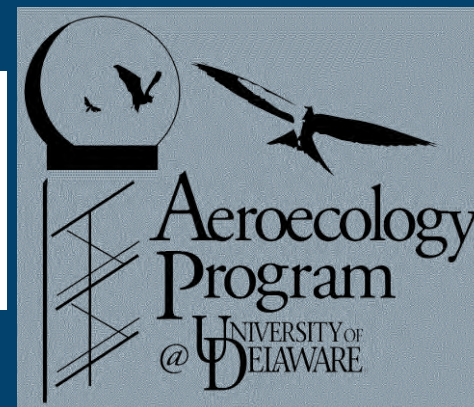
Van Doren et al. 2021



Solutions



Increasing concern and response across sectors



World Migratory Bird Day

Dim the Lights for Birds at Night

14 May and 8 October 2022



World Migratory Bird Day

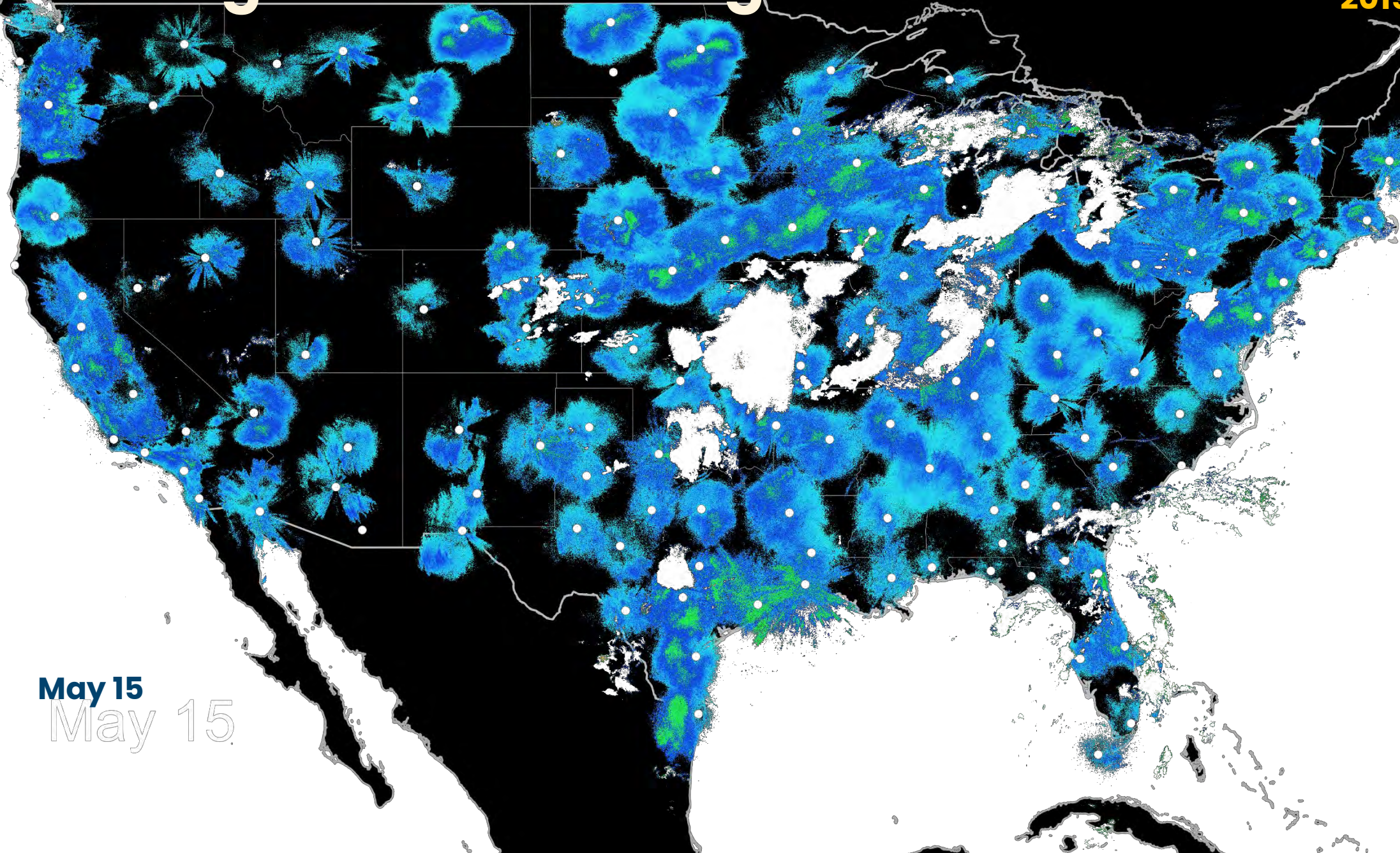


www.worldmigratorybirdday.org



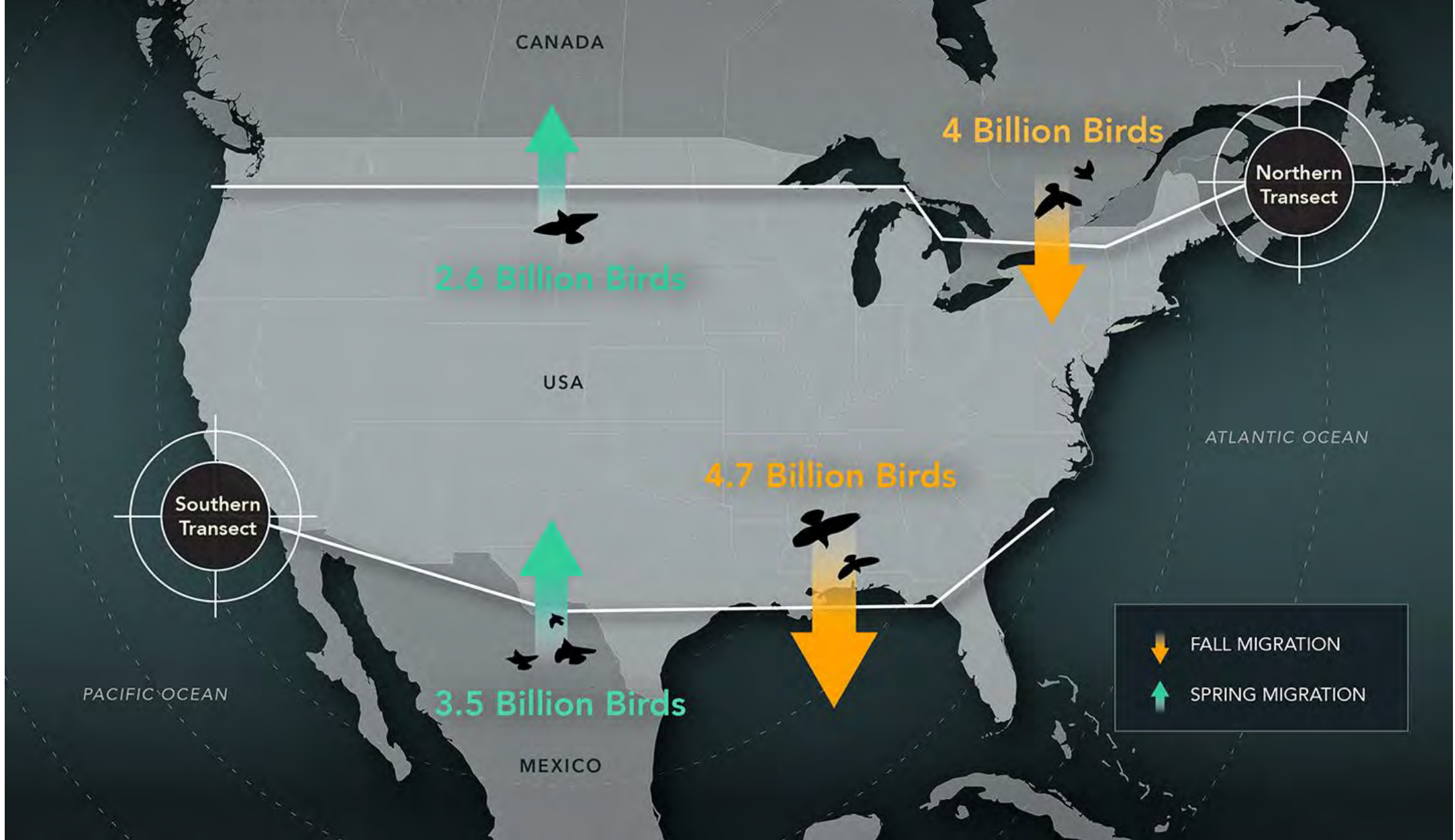
Ecological Forecasting

Horton
2019

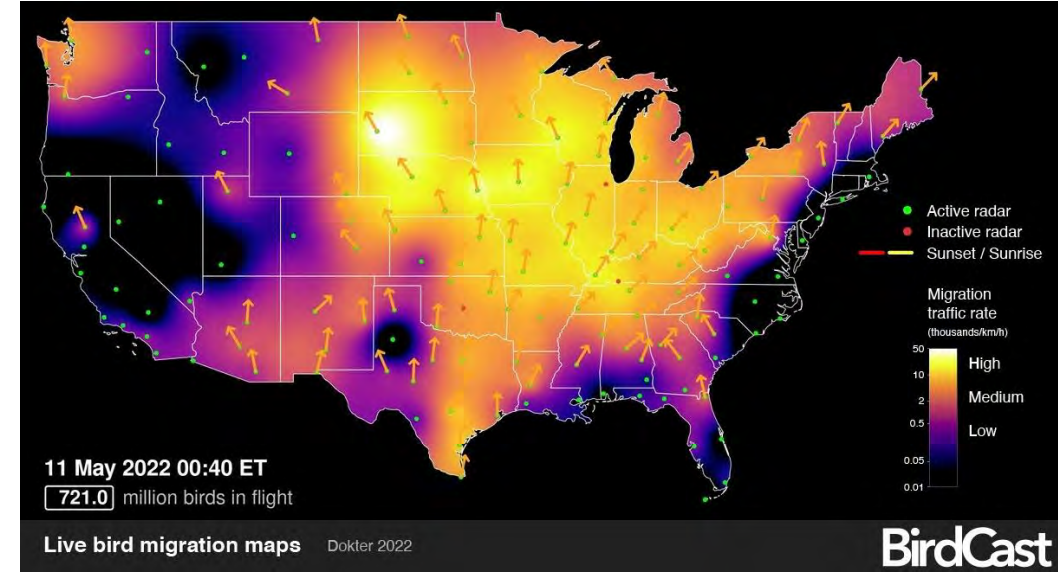
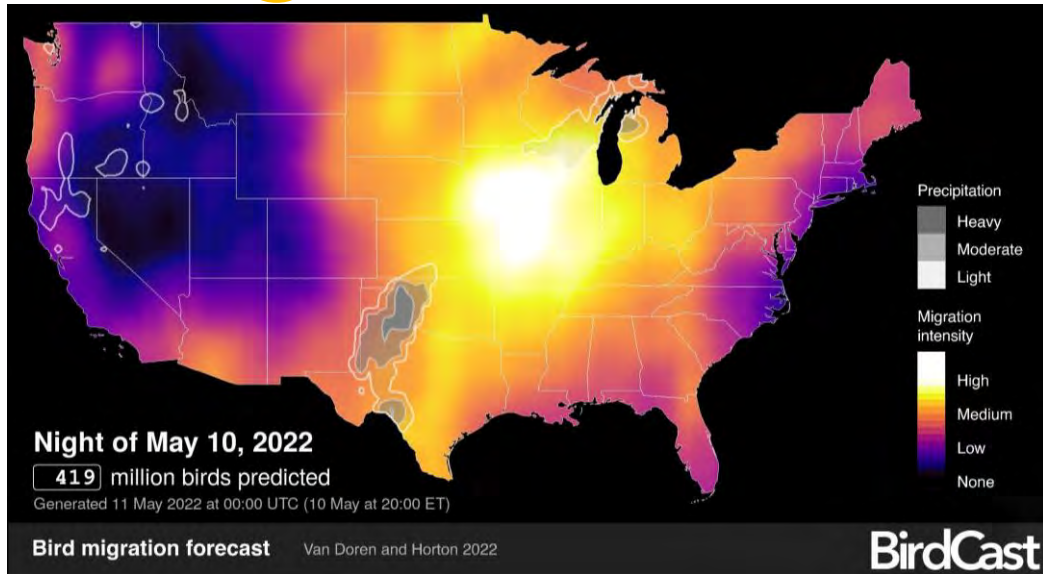


May 15
May 15

AVIAN AIRSPACE TRAFFIC



Migration Monitoring Tools and Data



Lake Charles, LA, USA Change location

Tonight's migration forecast
 Night of Tuesday, May 3

High >18,000 birds/km/night

Migration alert
 Look and listen for birds tonight and tomorrow morning!

The BirdCast model predicts a peak bird migration night with high intensity migration. Check your local patch, listen out your window, and look to the skies both day and night to see what migrants are on the move through your area. Remember that high intensity nocturnal migration may not necessarily mean an excellent day of birding; rather it means that large numbers of birds are migrating or predicted to migrate at night! Go out to look and listen, and then please submit your observations to eBird! [Learn more](#)

3-night migration forecast

<p>Tue, May 3 High >18,000 birds/km/night</p>	<p>Wed, May 4 High >18,000 birds/km/night</p>	<p>Thu, May 5 High >18,000 birds/km/night</p>
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98,261,800
 Birds crossed Missouri this night (est.) **High**

Starting: Sun, Oct 3, 2021, 6:50 PM CDT
 Ending: Mon, Oct 4, 2021, 7:00 AM CDT

PEAK MIGRATION TRAFFIC
130,903,100 Birds in flight (est.) **High**
 Direction: S Speed: 28 mph Altitude: 2,200 ft
 Recorded: Sun, Oct 3, 2021, 10:10 PM CDT
 Not all birds may fully cross a region in one night, resulting in a greater number of birds in flight than total birds crossed.

Here's what happened across this night...

Birds in flight
 143M
 Night of Oct 3, 2021

Flight direction and speed
 29 mph
 Night of Oct 3, 2021

Altitude
 3000 ft
 Night of Oct 3, 2021

And across this season...

Birds in flight (nightly avg.)
 60M
 Fall 2021

Total birds crossed
 1.1B
 Fall 2021

Expected nocturnal migrants
 Nocturnally migrating species most likely to arrive or depart this region at this time of year, based on frequency of observations.

- Eastern Wood-Pewee
- American Redstart
- Swamp Sparrow
- Yellow-bellied Sapsucker
- Yellow-billed Cuckoo
- White-eyed Vireo
- Black-and-white Warbler
- Northern Parula
- Chestnut-sided Warbler

POWERED BY: The Cornell Lab of Ornithology, Colorado State University, UMassAmherst

Human Dimensions

Understanding:

- Perceptions
- Comfort
- Fears
- Response to information



Lighting Best Practices – What to do

1. Evaluate
2. Plan
3. Act
4. Spread the word



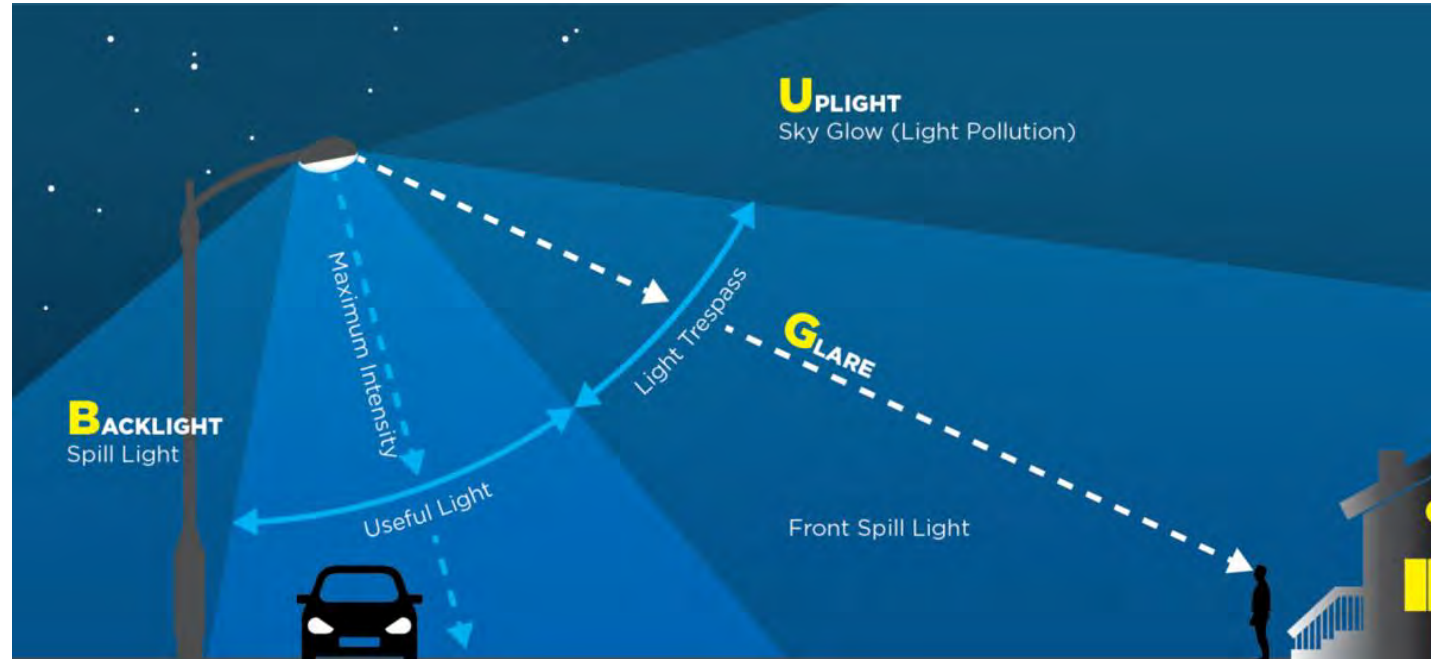
Lighting Best Practices

1. Avoid lighting

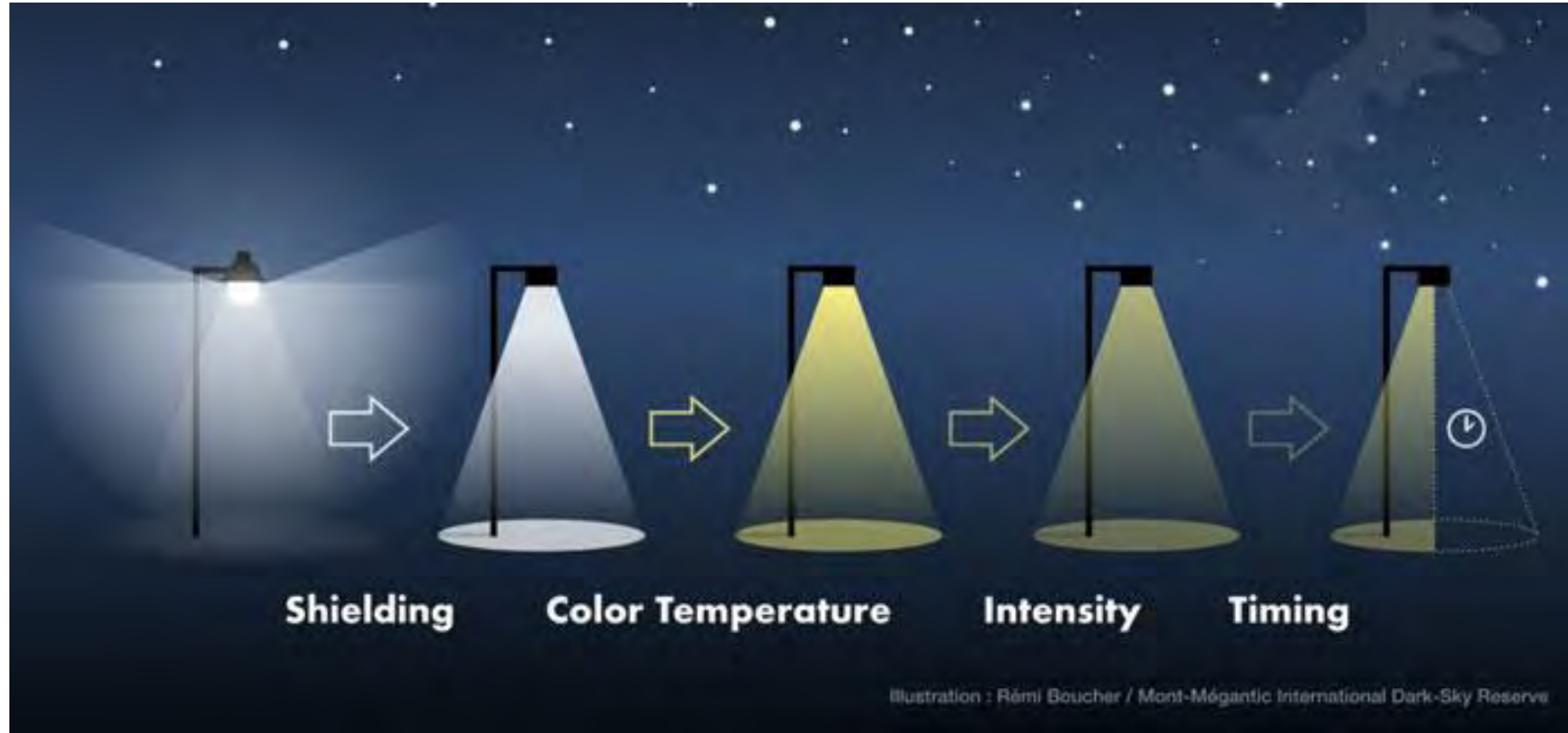


Lighting Best Practices

2. As little lighting as possible, where and when it's needed



Lighting Best Practices



New vs replace vs retrofit

- Incorporate into new construction plans
- Replace existing lights
- Retrofit existing lights



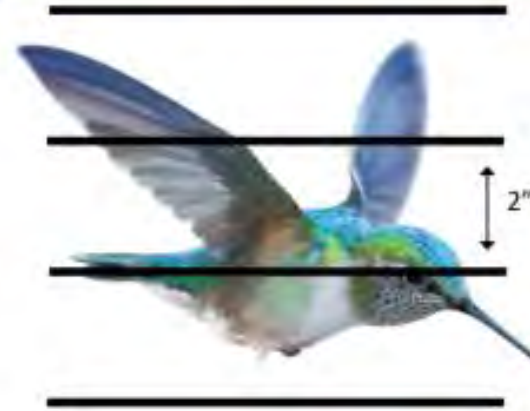
What can we do?!

Immediate – low to no cost

Glass Solutions

- Stickers, strips, and films
- Zen curtains
- Soap, paint

DAYTIME SOLUTIONS - 2" / 4" RULE



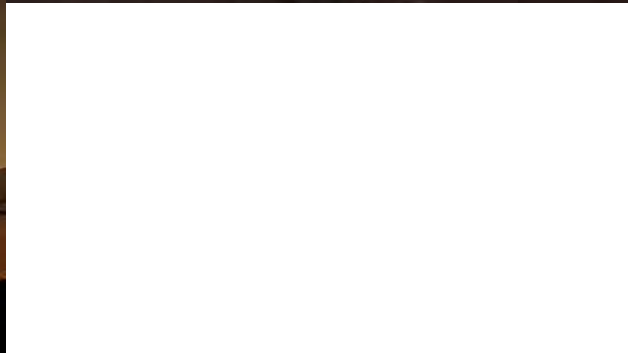
Horizontal lines with a maximum spacing of 2 inches



Vertical lines with a maximum spacing of 4 inches







What can we do?!

Long-term – glass type and building architecture

- Screens and netting
- Etching and fritting
- New technologies and glass types
- Glazing





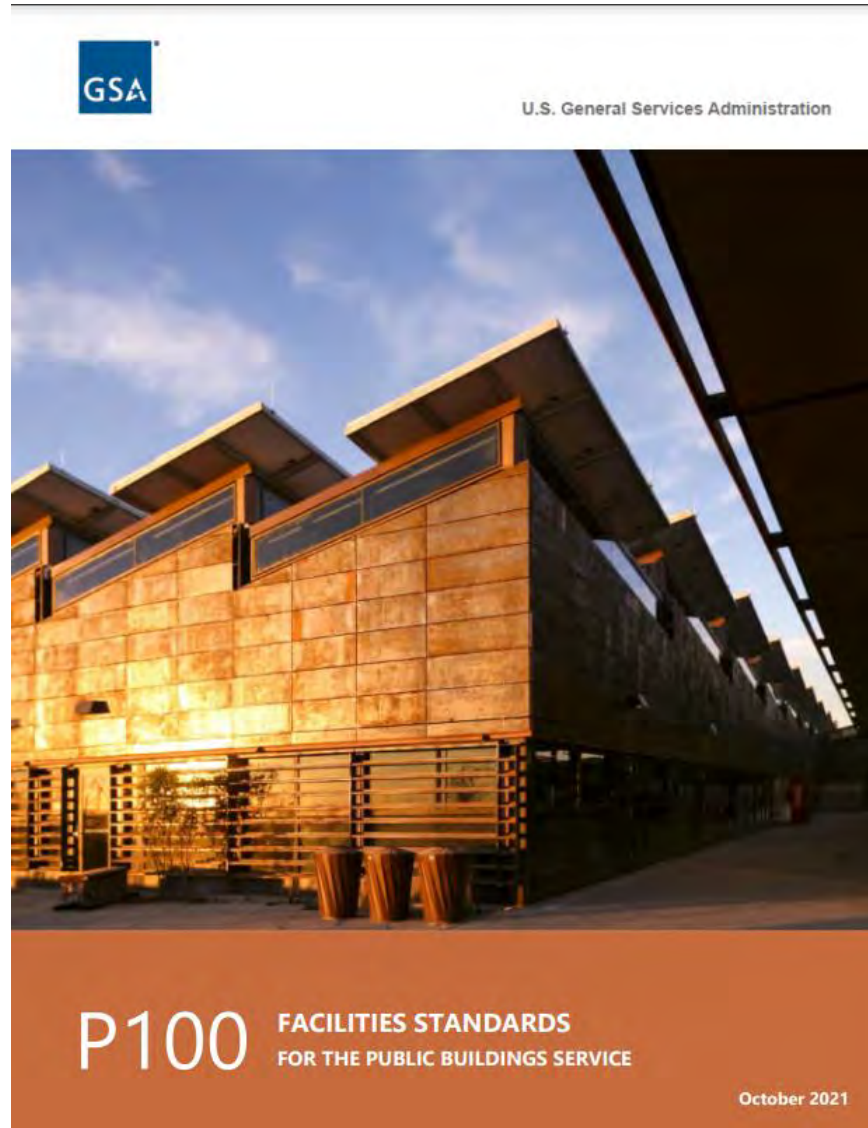
Why should we act?

- Migratory Bird Treaty Act
- Endangered Species Act
- Executive Order 13186
- Council MOU between DoD and USFWS
- DoD Climate Adaptation Plan



© Eric Kershner

Why should we act?



Migratory Bird Program - Conserving America's Birds

Appropriations language - 2022 refers to HR 117-83

“Applies to DOI and related agencies”

Bureau of Land Management, United States Fish and Wildlife Service, National Park Service, United States Geological Survey, Bureau of Ocean Energy Management, Bureau of Safety and Environmental Enforcement, Office of Surface Mining Reclamation and Enforcement, Bureau of Indian Affairs, Bureau of Indian Education, Office of the Special Trustee for American Indians, Office of the Secretary, Insular Affairs, Office of the Solicitor, Office of Inspector General,

Title II--Environmental Protection Agency,

Title III--Related Agencies: Office of the Under Secretary for Natural Resources and Environment, Forest Service, Indian Health Service, National Institute of Environmental Health Sciences, Agency for Toxic Substances and Disease Registry.

Other Related Agencies: Council on Environmental Quality and Office of Environmental Quality, Chemical Safety and Hazard Investigation Board, Office of Navajo and Hopi Indian Relocation, Institute of American Indian and Alaska Native Culture and Arts Development, Smithsonian Institution. National Gallery of Art, John F. Kennedy Center for the Performing Arts, Woodrow Wilson International Center for Scholars, National Endowment for the Arts, National Endowment for the Humanities, Commission of Fine Arts, National Capital Arts and Cultural Affairs, Advisory Council on Historic Preservation, National Capital Planning Commission, United States Holocaust Memorial Museum, Presidio Trust, World War I Centennial Commission

Appropriations language

BIRD COLLISIONS ON FEDERAL PROPERTY

...At a minimum, all agencies are directed to take low cost or no cost action, such as turning off interior lights at night or applying films or other adhesives to glass windows to reduce bird collisions....



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What is the USFWS doing to address glass collisions?

- [New webpage](#) with glass and lighting information and resources
- Combining energy conservation & collision reduction
- Targeted lighting recommendations
- Incorporating lighting into IPaC
- Collisions videos (towers and lights)
- Diverse partnerships (NWRS, DoD, USCG, marine environments)
- Teaching facilities management to apply products and manage lights
- Great American Outdoors Act construction is bird-safe
- Building collaboration among U.S., Canada, and Mexico
- Regional *Points of Contact* and communication strategies
- [Sharepoint](#) for Service employees with [survey of FWS facilities](#)

Resources available through the Service



REDUCING BIRD COLLISIONS WITH BUILDINGS AND BUILDING GLASS BEST PRACTICES

U.S. FISH AND WILDLIFE SERVICE
DIVISION OF MIGRATORY BIRD MANAGEMENT
FALLS CHURCH, VIRGINIA

JANUARY 2016
UPDATED FEBRUARY 2021



Methods to Reduce Bird Collisions with Glass When Remodeling and Designing New Facilities Migratory Bird Program, U. S. Fish and Wildlife Service Falls Church, Virginia November 2020

Every year nearly one billion birds fatally collide with glass in the U.S. While most people consider bird collisions with glass to be an urban phenomenon involving tall, mirrored-glass skyscrapers, the reality is that 56% of collision mortality occurs at low-rise buildings (i.e., one to four stories), 44% at urban and rural residences, and <1% at high-rise buildings ([Loss et al. 2014](#)). Many government facilities and refuge visitor centers fit the description of the buildings involved in most bird collisions. Fortunately, [low-cost, attractive glass treatments](#) are available for existing buildings, while new builds and remodels can incorporate [bird-safe building design](#) and specialized glass. Many of bird-safe measures simultaneously reduce energy costs. Recent research quantifying that bird populations in North America have declined by [nearly three billion birds](#) over the last 50 years, deserves a strong response from federal agencies and an increased focus on tangible actions that result in measurable conservation outcomes, such as reducing bird collisions with glass.

Minimizing bird collisions with glass is consistent with 116-100 – Department of the Interior, Environment and Related Agencies Appropriations Bill 2020; the Government Services Administration (GSA) P100 Facilities Standards for the Public Buildings Service; and a continuously growing public concern about bird population declines. In June 2020, the House of Representatives passed H.R. 2, the Bird Safe Buildings Act, which mandates all public buildings managed by GSA to be designed or altered in a bird friendly manner. Leadership in Energy and Environmental Design (LEED) acknowledges the importance of [bird-friendly design](#) and related [measures](#) through associated credits. In addition, taking steps to reduce bird collisions with glass supports the intention of Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds.

Birds do not see clear or reflective glass as a barrier. Glass creates a lethal illusion of clear airspace. The majority of collisions occur during the day when birds can see landscape reflections in the glass (e.g., clouds, sky, vegetation, or the ground); or birds see through glass to perceived habitats (e.g., potted plants or vegetation inside buildings). When inclement weather occurs during spring and fall bird migrations, birds can be attracted to lighted facilities; resulting in collisions, entrapment, excess energy expenditure, exhaustion, and occasionally large-scale nighttime mortality events.



LOW-COST METHODS TO REDUCE BIRD COLLISIONS WITH GLASS

Every year, nearly one billion birds collide with glass in the U.S. While most people consider bird collisions with glass to be an urban phenomenon involving tall, mirrored-glass skyscrapers, the reality is that 56% of collision mortality occurs at low-rise buildings (i.e., one to four stories), 44% at urban and rural residences, and <1% at high-rise buildings (Loss et al. 2014). Many government facilities and refuge visitor centers fit the description of the buildings involved in most bird collisions.

Fortunately, low-cost, attractive solutions are available to building owners and managers. Recent research quantifying the loss of nearly three billion birds in North America over the last 50 years deserves a strong response from federal agencies and an increased focus on tangible actions that result in measurable conservation outcomes, such as reducing bird collisions with glass.



The U.S. Fish and Wildlife Service helped fund a bird-safe window retrofit demonstration at the Oregon Museum of Science and Industry.

Building Survey

Bird Safe Buildings Survey

experience.arcgis.com/experience/771022c4ed9f466f9599bc195bddf2e1

Managed bookmarks | DOI Remote Access | - Employee Express | Sign in to Concur | Quicktime Quicktim... | DOI Talent | Course: Telework Fu... | GSA | Other bookmarks

U.S. Fish & Wildlife Service
Bird Safe Buildings Survey

Survey Results Risk Scores Resources Survey Editors Only

NATIONWIDE EFFORT TO REDUCE BIRD COLLISIONS

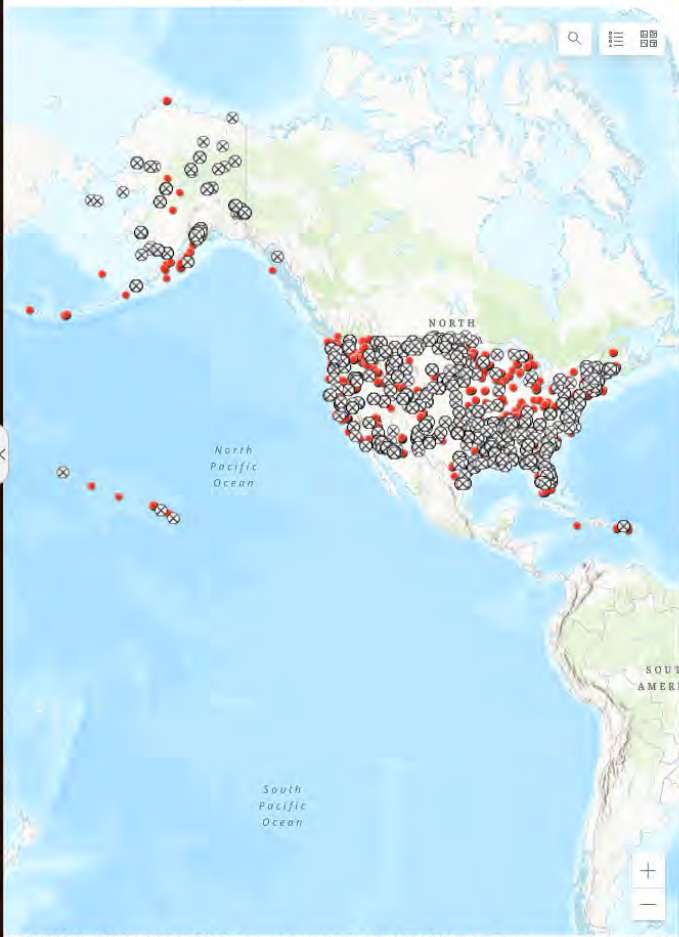
[Instructions](#)

The USFWS is undertaking a nationwide effort to understand which Service buildings cause the biggest risk for birds. Completing this quick, easy survey helps us determine the relative risk of bird collisions with buildings, whether bird friendly measures are in use, and if bird collision monitoring has occurred. The survey should take only 4-10 minutes per building. If you choose to monitor your buildings or have in the past, see the monitoring resources below and enter your data into the spreadsheet linked to this survey. We provide assistance, information, resources, and when possible, financial support.

Please contact
Joelle_Gehring@fws.gov

FOR MORE INFORMATION FOR MAKING YOUR BUILDINGS MORE BIRD FRIENDLY [click here](#)

Zoom to your station



Select Building

- Complete
Abernathy Fish Technology Center
Service Shop Maintenance, BLDG MAINT SHOP, MAINTENANCE SHOP
Complete
- Abernathy Fish Technology Center
Fish Production, BLDG FISH PROD, HATCHERY BUILDING
- Abernathy Fish Technology Center
Office, BLDG OFFICE, MAIN CONFERENCE ROOM BLDG
- Abernathy Fish Technology Center
Laboratory, BLDG LAB, CONSERVATION GENETICS LABORATORY
- Abernathy Fish Technology Center
Fish Production, BLDG FISH PROD, SELECTIVE BREEDING BLDG
- Abernathy Fish Technology Center
Office, BLDG OFFICE, MAIN OFFICE AND VISITATION BLDG
- Abernathy Fish Technology Center
Single Family Housing, BLDG QTRS#001, RESIDENCE #1
- Abernathy Fish Technology Center
Laboratory, BLDG LAB, MAIN LABORATORY
- Abernathy Fish Technology Center
Laboratory, BLDG LAB, ECOPHYS LABORATORY
- Complete
Agassiz National Wildlife Refuge
Communication Systems, BLDG COM SYS RADIO SHACK (UNDER FIRE TOWER)
Complete
- Complete
Agassiz National Wildlife Refuge

Complete survey for each building

1 of 50

Survey Status
If the survey status is "Complete" please do not submit another survey for this building.
Complete

Station
Abernathy Fish Technology Center

Building/Structure Type
Service Shop Maintenance

FWS Region
1

Interior Region
9

Asset Number
10002435

More building info
BLDG MAINT SHOP, MAINTENANCE SHOP

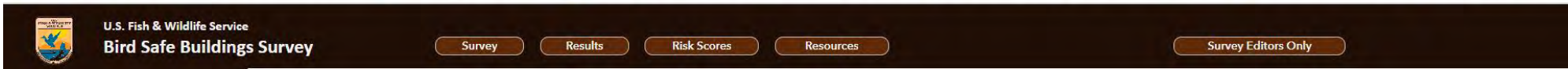
Esri, USGS | Esri, FAO, NOAA, USGS | To be provided by the Refuge | USFWS Migratory Birds | Powered by Esri | Last update: 12 seconds ago

6.8 million birds/year in the U.S. and Canada

(Longcore et al. 2012)



Results! Dashboard



COLLISIONS RISK SCORES AND DATA DOWNLOAD

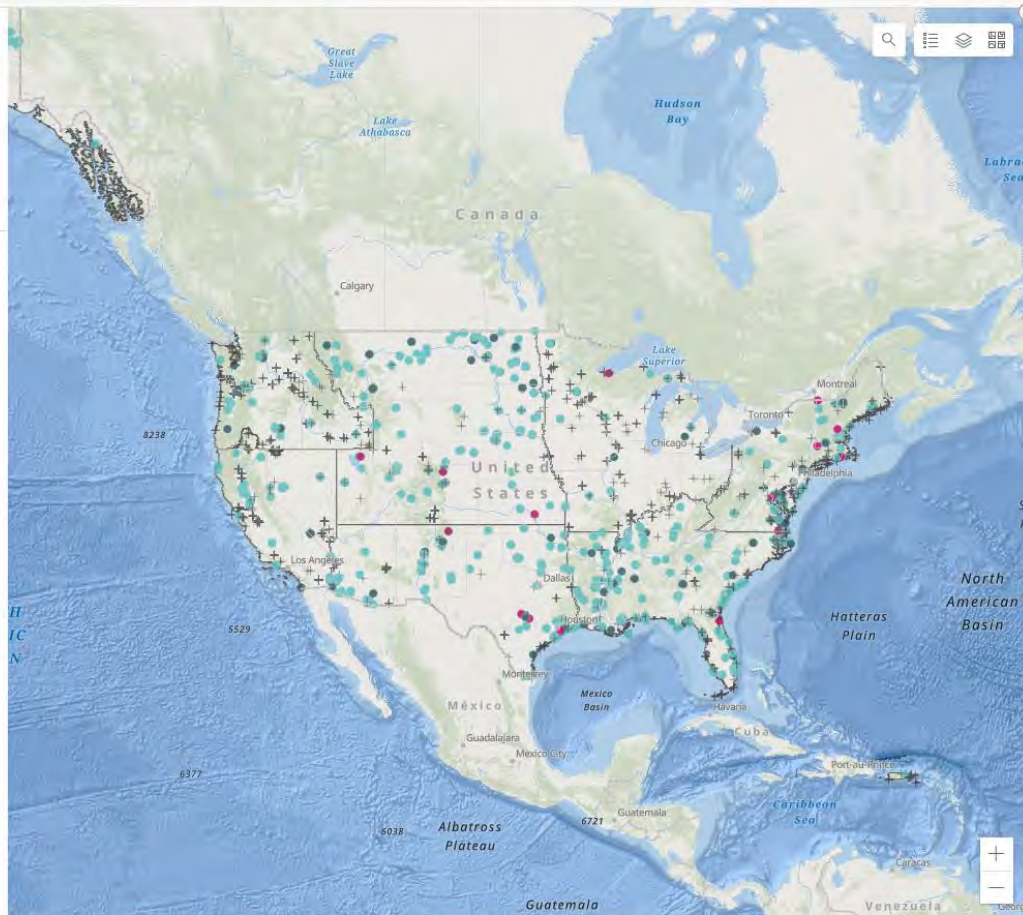
Use the selector button to view buildings by risk score in each region. Download all the data or data by region using the button at the bottom of the list on the right. Click [HERE](#) to download data column/fields explanation sheet.

Your individual responses to the survey produces a Collision Risk Score. The higher the Collision Risk Score, the more dangerous the building or tower is for birds. Knowing the score of each structure at your site can help prioritize implementing treatments. Regions may use other data in addition to the risk score to prioritize treatments, for example, size of the building or visitation to the building. You can lower your building's Daytime Risk Score by installing FWS-recommended window treatments that reduce glass reflectivity and make the glass visible to birds. Additionally, you can lower Nighttime Risk Scores with simple, cost-saving measures that reduce light pollution, which disorients and attracts migrating birds to glassed buildings. Communication towers can be retrofitted to be safe for birds as well. Thank you for your participation in the Bird Safe Buildings Survey. Together, we

Building collision risk score filter data by region and use download data button at the bottom of list for a copy of the data

- All buildings (surveyed and not surveyed)
- Daytime collisions risk score
- High risk - scores > 7 - 14
 - Medium risk - scores > 4 - 7
 - Low risk - scores -1 - 4
 - + Building not surveyed.

FWS Regional Boundaries



Select a Region
All Regions

- Natural Resources Program Center, Office, 50000049924-GSA Provided-OAK RIDGE BLDG-64NC231..., Colorado; Region: 9
 - Survey contact: lee_obrien@fws.gov
 - Daytime Risk Score: 14
 - Nighttime Risk Score: 13
 - Tower Risk Score: 0
- San Diego Bay National Wildlife Refuge, Office, BLDG OFFICE SWMU HQ OFFICE, California; Region: 8
 - Survey contact: victoria_apaldetti-marquez@fws.gov
 - Daytime Risk Score: 13
 - Nighttime Risk Score: 14
 - Tower Risk Score: 0
- Blackwater National Wildlife Refuge, Visitor Center, BLDG VC - VISITOR CENTER, Maryland; Region: 5
 - Survey contact: jessica_gorski@fws.gov
 - Daytime Risk Score: 12
 - Nighttime Risk Score: 12
 - Tower Risk Score: 0
- Audubon National Wildlife Refuge, Office, BLDG OFFICE, AUDUBON'S HQ/VC, North Dakota; Region: 6
 - Survey contact: johannaruff@msu.montana.edu
 - Daytime Risk Score: 11
 - Nighttime Risk Score: 14
 - Tower Risk Score: 0
- Sand Lake National Wildlife Refuge, Office, BLDG OFFICE, WOOD FRAME, HQTRS, South Dakota; Region: 6
 - Survey contact: johannaruff@msu.montana.edu
 - Daytime Risk Score: 11
 - Nighttime Risk Score: 14
 - Tower Risk Score: 0
- Assistant Director-Business Management and Oper..., Office, 50000305231-GSA Provided-AVA07935 HQ, Arlington ..., Virginia; Region: 9
 - Survey contact: joelle_gehring@fws.gov
 - Daytime Risk Score: 11
 - Nighttime Risk Score: 14
 - Tower Risk Score: 0
- J. Clark Salyer National Wildlife Refuge, Visitor Contact Station, BLDG OFFICE VC, North Dakota; Region: 6
 - Survey contact: johannaruff@msu.montana.edu

Midwest Bird Friendly Challenge



Southwest Bird Friendly Design

Valle de Oro National Wildlife Refuge



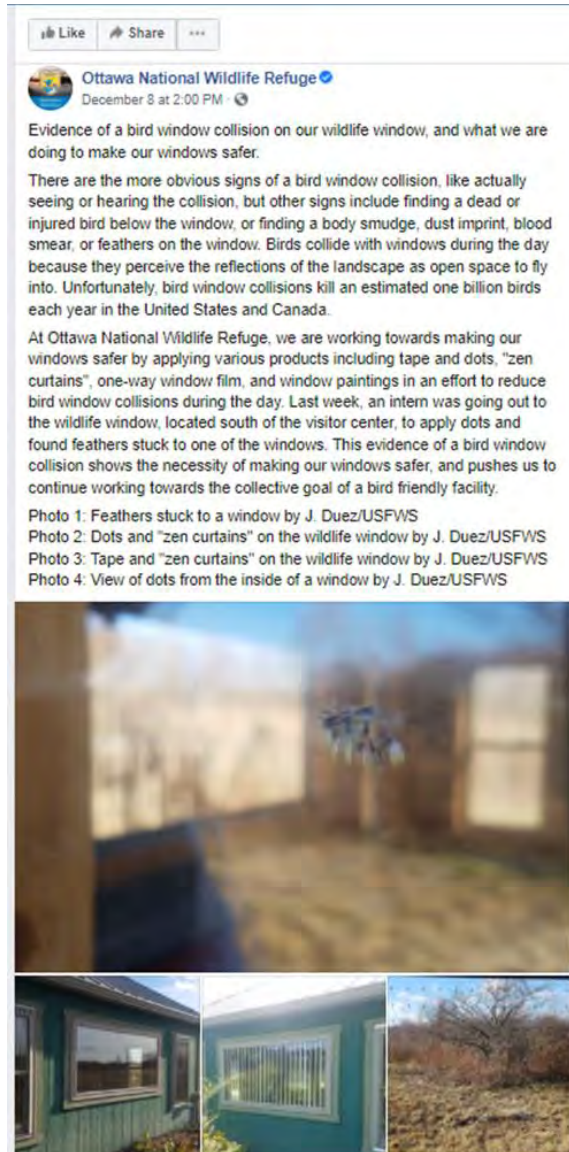
Migratory Bird Program - Conserving America's Birds

National Park
Service,
Everglades
National Park



Share the good news!

Social media posts and other outreach



#birdcollisions



Dark Skies as an Asset

White Sands Missile Range

- Tracking of celestial objects
- Concealment of testing
- Night-vision equipment testing or use



Ground-Based Electro-Optical Deep Space Surveillance (GEODSS)



DoD Unified Facilities Criteria

UFC 3-530-01
01 April 2015
Change 4, 01 November 2019

UNIFIED FACILITIES CRITERIA (UFC)

INTERIOR AND EXTERIOR LIGHTING SYSTEMS AND CONTROLS



APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED



DoD Unified Facilities Criteria

FC 3-530-01 INTERIOR AND EXTERIOR LIGHTING SYSTEMS AND CONTROLS

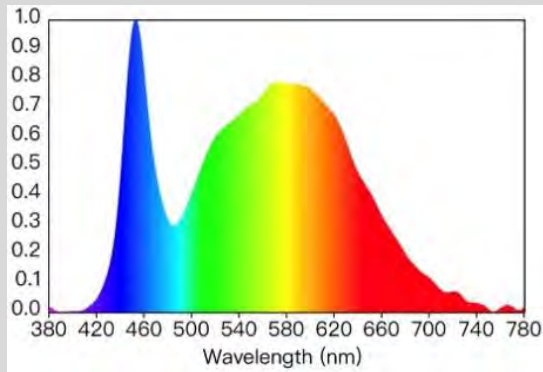
- 4-1.3.1 Direct Glare: Avoid direct glare from luminaires and excessive contrast of surfaces. Use shielded light sources and as low a wattage as possible.
- 4-1.3.2 Light Pollution/Trespass: Use fully shielded or IES U0 luminaires to eliminate direct light above the horizontal plane. Refer to maximum allowable uplight (U) and backlight (B) ratings in specific lighting zones.
- 4-2 Lighting Zones: Lighting zones reflect the base (or ambient) light levels desired for an area. Adopt the lowest possible lighting zone.
- 4-3 Lighting Controls (switches, timers, dimmers, etc.)
- 4-4.2 Light Source Technology: Use a CCT of no greater than 4100K to reduce skyglow.
- 4-4.2.1 Use amber LEDs in place of Low Pressure Sodium (LPS) for sensitive environments such as wildlife habitat, observations, wildlife nesting, or to meet dark sky requirements (observatories). Incorporate Fish and Wildlife, State, and local governing authority recommendations for lighting systems design and installation.
- 6-2.7.3 High Level of Protection (HLOP). Use controlled lighting, except when dictated by local threat environment. (then “Glare Projection” can be used)



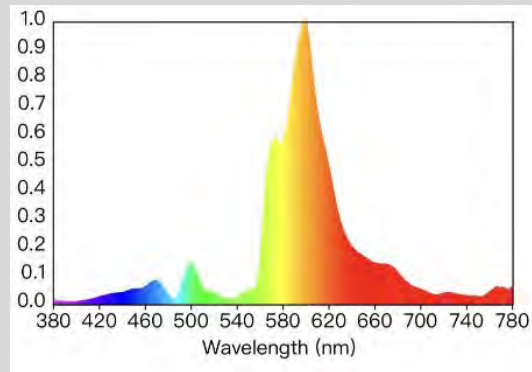
Results

SOURCE AND SPECTRUM

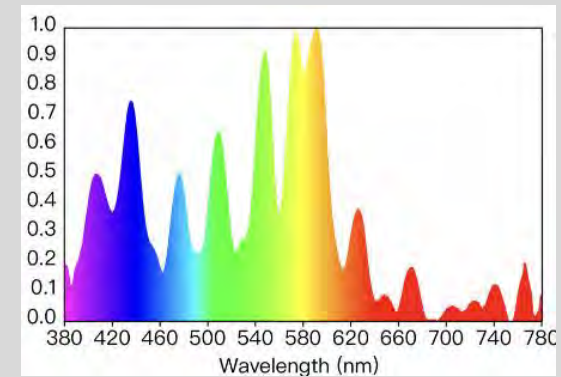
Source	Count	Median	
		Spectral Peak (nm)	CCT (K)
LED	729	450	3908
Sodium Vapor	106	600	1900
Metal Halide	52	590	4478
Incandescent	5	780	2884
Fluorescent	2	540	3822
All Sources	894	450	3908



LED



HP Sodium Vapor



Metal Halide



Results


TILT AND UPLIGHTING

Tilt (degrees)	Count
0	666
10	4
30	74
45	34
60	58
80	17
90	31
>90	4



	Pole	Bollard	Building	Other	Total
No Uplight	562	48	18	1	629
Uplight	122	55	77	5	259



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- **What resonates with you?**
 - **Where are opportunities for progress at work and home?**
 - **What tools would you like us to share?**

