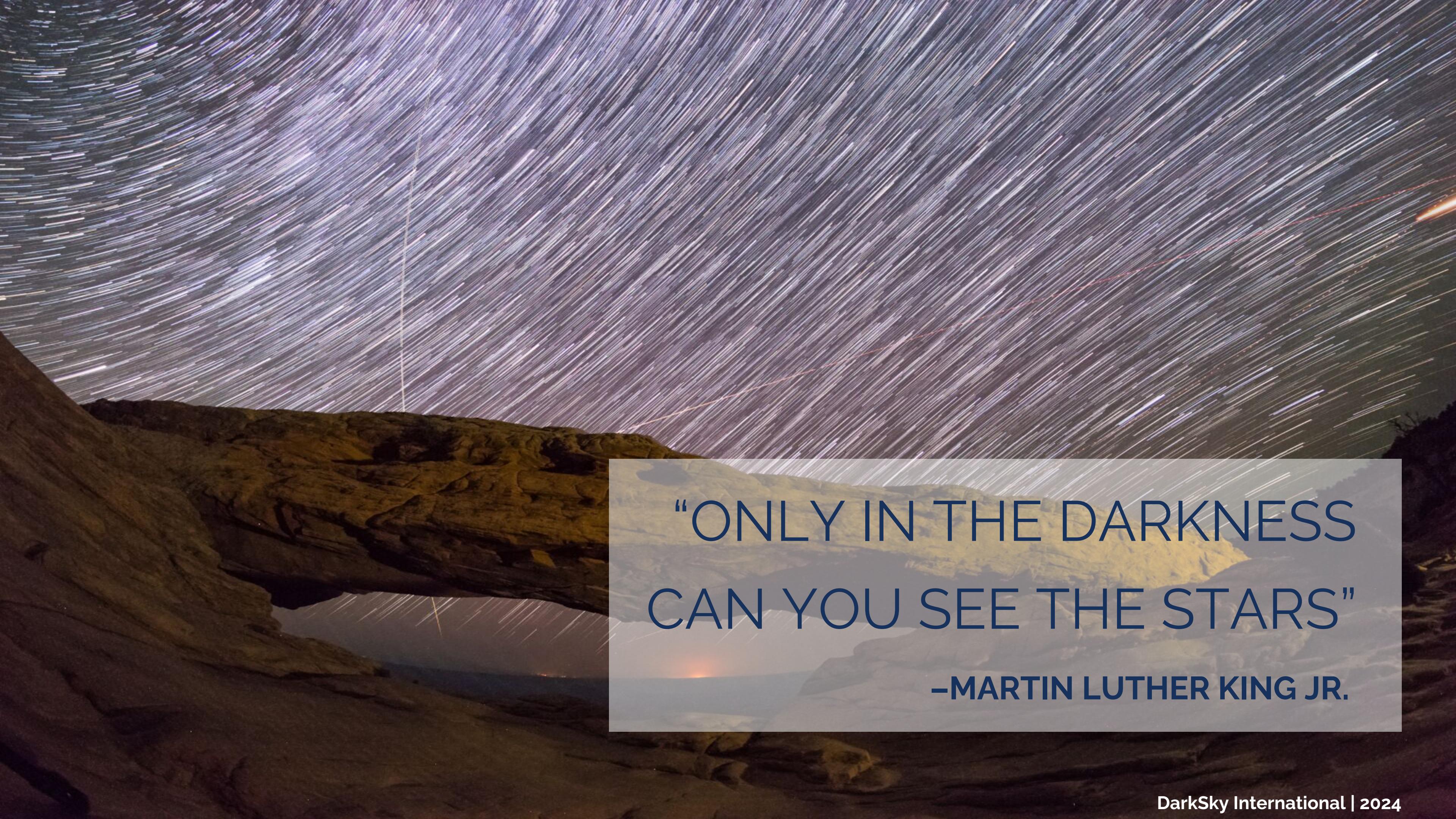


# Artificial Light at Night Impacts to Birds and other Animals

Trish Cutler  
State Council  
NM Chapter of DarkSky International





**“ONLY IN THE DARKNESS  
CAN YOU SEE THE STARS”**

**-MARTIN LUTHER KING JR.**



Light pollution is increasing at 9.6% per year\*



# LIGHT POLLUTION

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Any adverse effect on humans or other animals from artificial light at night.

Image: Mike Knell



# SKYGLOW

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# GLARE

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A photograph of a residential street at night. The houses are dark, but the bright yellow glow from the streetlights creates a hazy, overexposed effect, obscuring the sky and casting a warm light onto the surrounding yards and the brick wall of a house on the left.

# LIGHT TRESPASS

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# LIGHT POLLUTION CONSEQUENCES

# ECOLOGICAL IMPACTS

# Most Bird Species in North America are Migratory

70%

of terrestrial recurring  
birds are migratory.

80%

of those birds migrate  
at night.



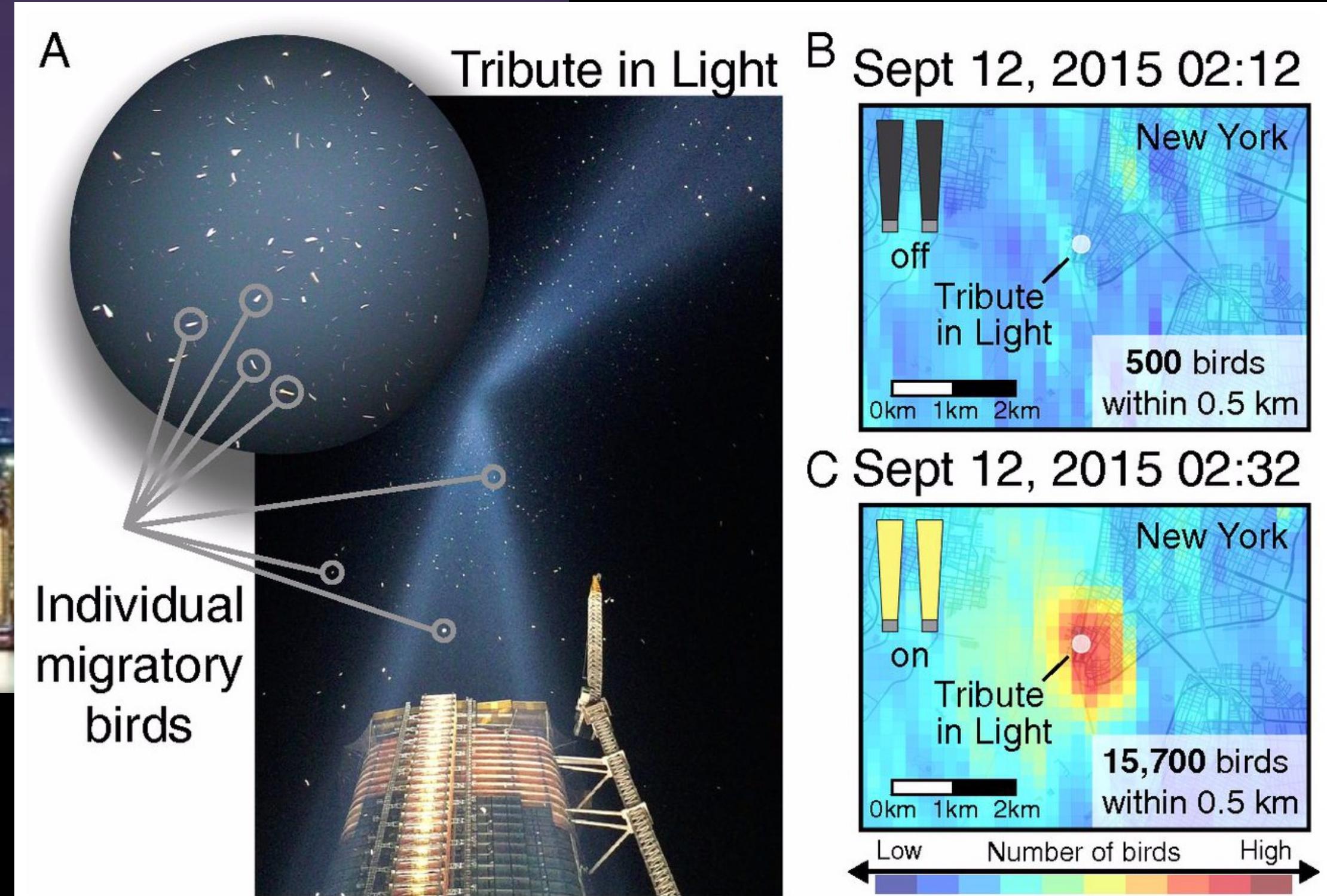
# Spring/Fall Bird Migration

- Day length is a cue for timing of migration
- Sky glow affects navigation
- Attraction, capture, and collision

# Beyond Bird Migration

- Habitat avoidance
- Change in circadian rhythms
- Other phenology shifts
- Altered predator/prey relationships

# National 9/11 Memorial & Museum Tribute in Light



Van Doren et al. 2017. High-intensity urban light installation dramatically alters nocturnal bird migration.

# Firefly-Friendly Lighting Practices



The Milky Way lights up the night sky over a field of fireflies. Views like this are becoming increasingly rare as artificial light at night diminishes natural darkness, competing with fireflies that use bioluminescence to communicate. However, there are many ways to make your lighting less disruptive to nearby fireflies.



The big dipper firefly (*Photinus pyralis*) is one of our most commonly encountered species.

and artificial lights that are on at this time can make it harder for them to see each other. It may also make fireflies more vulnerable to predators that would otherwise be repelled by their light. The resulting decreases in reproduction and survival could have severe consequences for firefly populations.

## How Are Lights Harmful to Fireflies?

Artificial light at night, or ALAN for short, may be one of the main drivers of firefly declines. At least 80% of the firefly species found in the United States and Canada communicate with each other using bioluminescent light signals in the form of flashes, flickers, or glows. These species are active at dusk or after dark,

## Where Does ALAN Come From?

ALAN can be caused by street and house lights, vehicle headlights, billboards, and even gas flares from oil fields. It is usually classified into three types, all of which can affect firefly populations:

1. Skyglow: this glowing haze over urban areas makes it hard to see the stars.
2. Light trespass: this occurs when light at ground level spreads beyond its intended or needed area.
3. Glare: this is any light that excessively illuminates areas or objects and can have a blinding effect.

Unfortunately for fireflies (and many other nocturnal and crepuscular animals), the night sky is brightening rapidly all over the world. The United States and Canada have reached the point where only a handful of areas are truly dark at night. In fact, 80% of people in North America can no longer see the Milky Way under even the clearest conditions, because it is obscured by skyglow.



## TREES

bud earlier and lose  
their leaves later  
under artificial light

# **ENERGY WASTE**



**3-7 BILLION DOLLARS**

spent every year on unneeded lighting

**21 MILLION TONS OF CO<sub>2</sub>**

burned by unnecessary lighting

# HUMAN HEALTH

# Concerns about LED street lighting

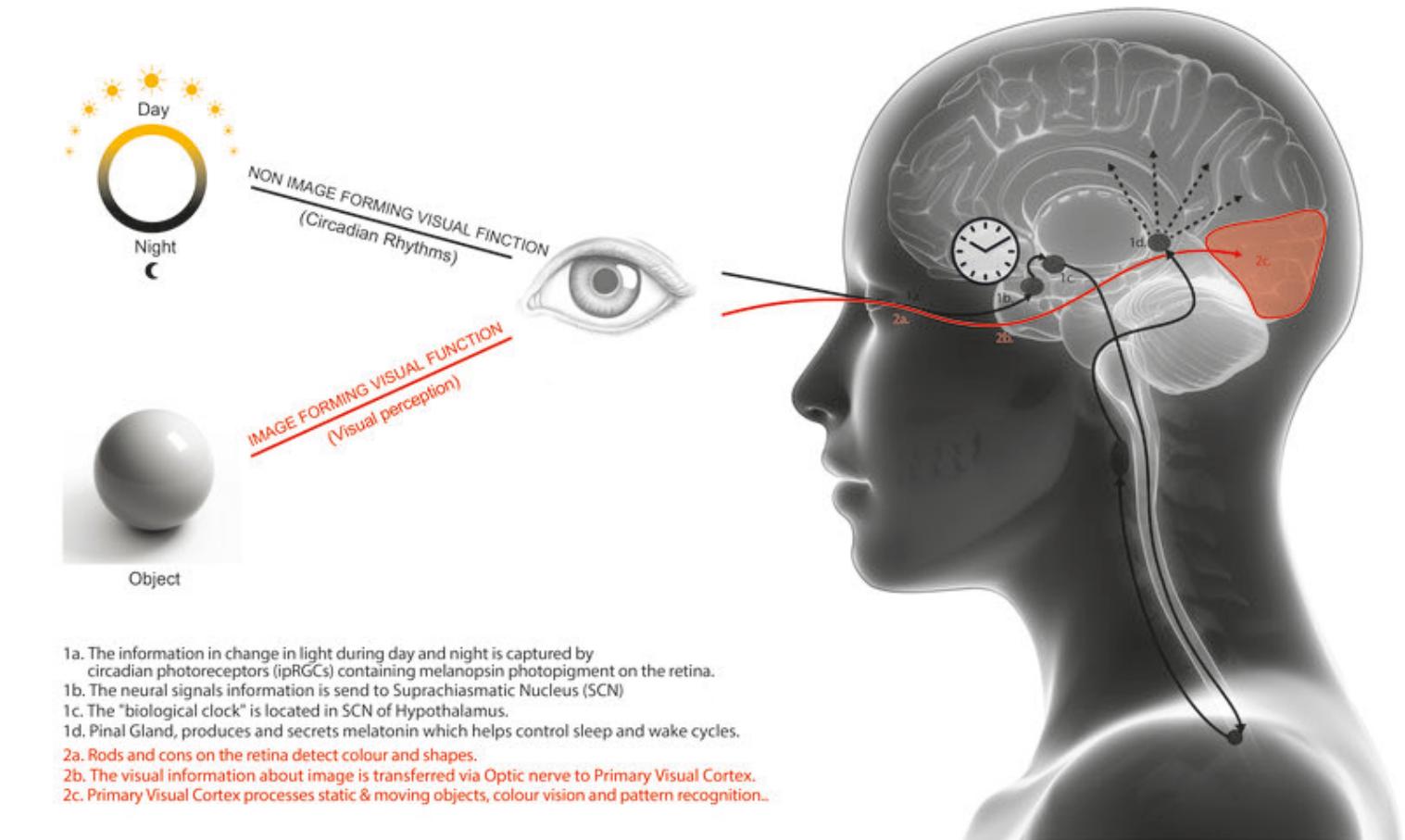
**Disability Glare** results in decreased visual acuity and reduced driving visibility.

A 4000K LED is emitted as blue light that the human eye perceives as a harsh white color. Our pupils constrict, and we can't see as well. A "veil of illuminance" leads to discomfort and reduced visibility.

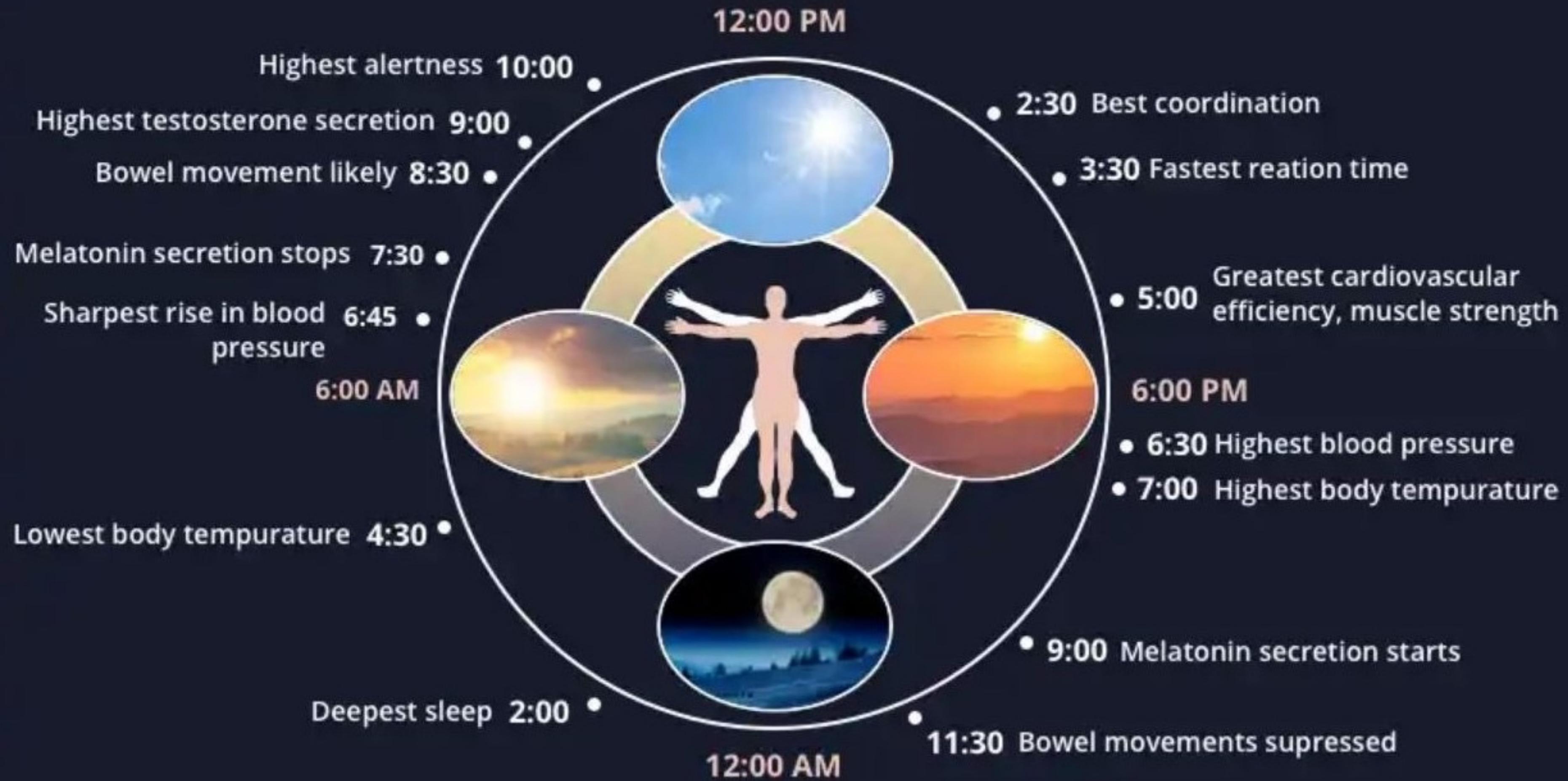
**Eye Damage:** Blue wavelengths create more scattering of light in the human eye and potential damage to retinas.

**Disruption of Circadian Rhythm** via melatonin suppression (LEDs 5x).

**Secondary negative health effects from chronic sleep disruption:** increased risk of cancer, diabetes, cardiovascular disease, and obesity.



Zielinska-Dabkowska and Xaviab. 2018. An overview of cognitive and biological effects of city nigntime illumination including a London case study.



# **SAFETY AND SECURITY**



**MYTH: MORE  
LIGHTING IS SAFER**

**REALITY: WELL DESIGNED  
LIGHTING IS SAFER**



# THE SOLUTION: BETTER LIGHTING DESIGN

UPLIGHT

GLARE ZONE

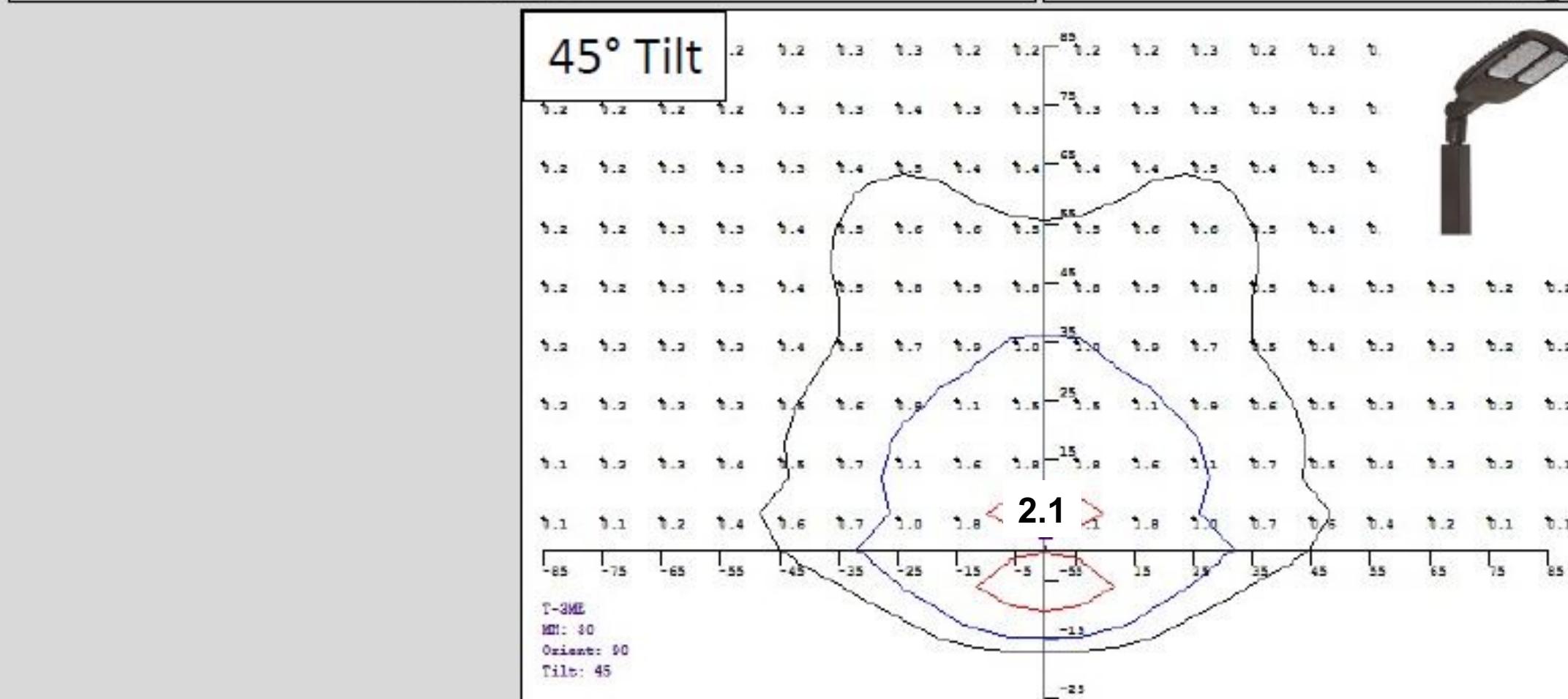
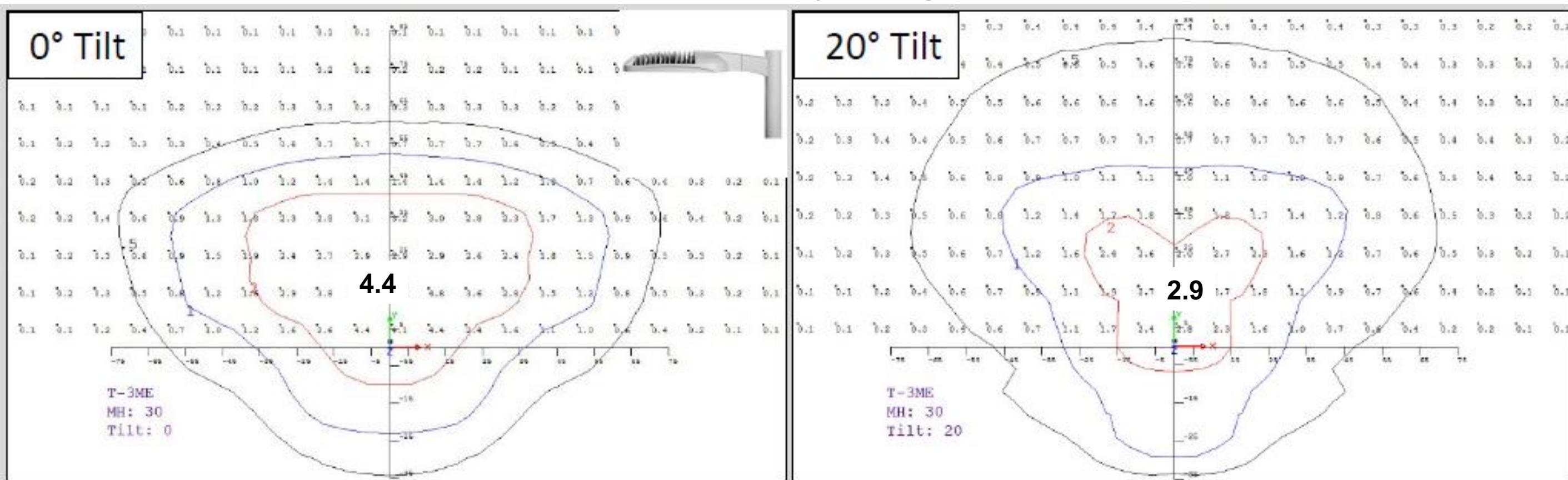
DIRECT GLARE

BACKLIGHT

USEFUL LIGHT



# Tilt Creates Poor Quality Light on the Ground



# Five Lighting Principles for Responsible Outdoor Lighting



DarkSky



IES Illuminating  
ENGINEERING SOCIETY

Responsible outdoor lighting is

## 1 Useful

### Use light only if it is needed

All light should have a clear purpose. Consider how the use of light will impact the area, including wildlife and their habitats.



## 2 Targeted

### Direct light so it falls only where it is needed

Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.



## 3 Low Level

### Light should be no brighter than necessary

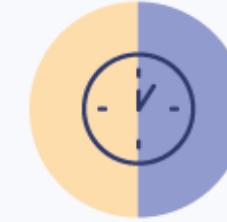
Use the lowest light level required. Be mindful of surface conditions, as some surfaces may reflect more light into the night sky than intended.



## 4 Controlled

### Use light only when it is needed

Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.



## 5 Warm-colored

### Use warmer color lights where possible

Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.



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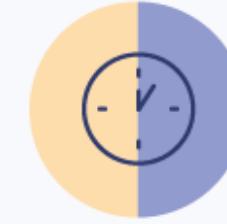
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worse

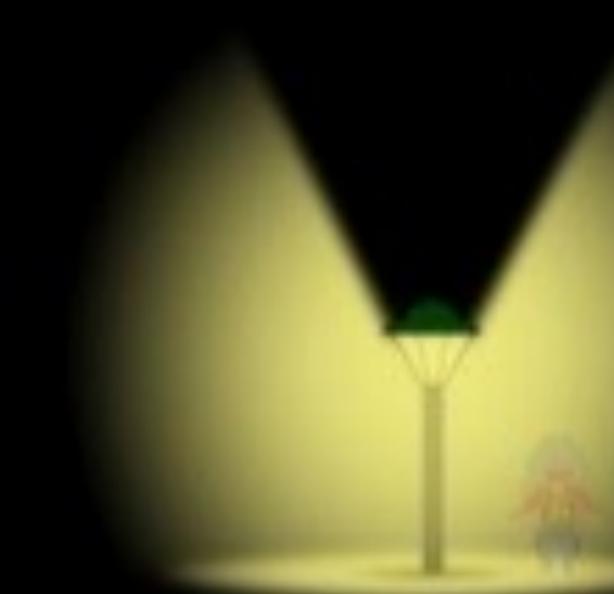
bad

good

better



Non-cutoff



Semi-cutoff



Cutoff



Full-Cutoff<sup>26</sup>

© 2011 Wynn/McDonald Observatory



**BAD**



**GOOD**



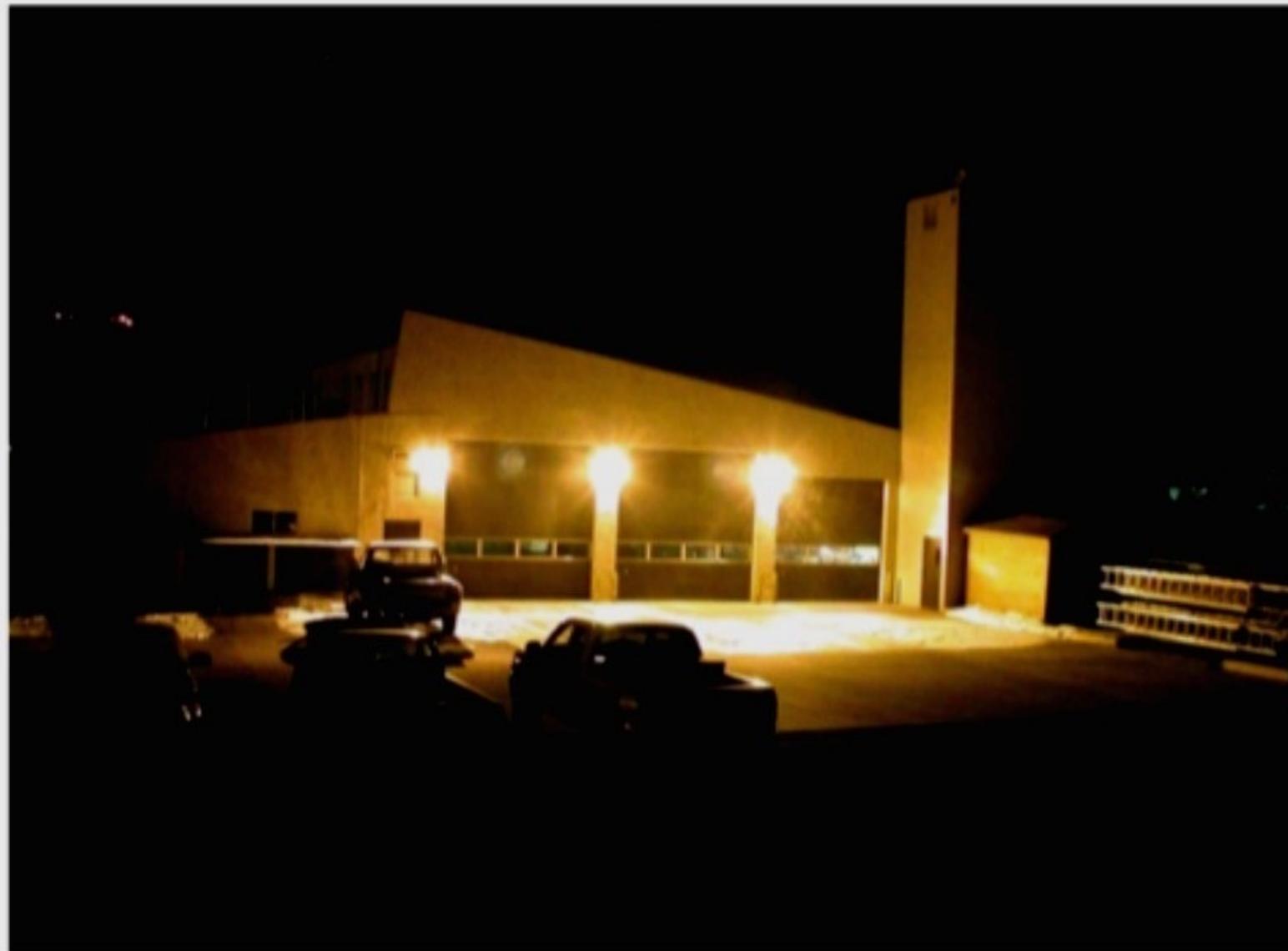


**BAD**



**GOOD**

# Positive Effects of Shielding



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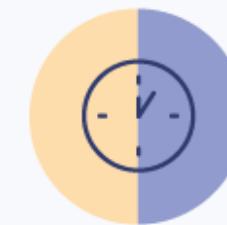
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# INTENSITY

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# CONTROLS



We need to move beyond the **photo-cell** to more sophisticated controls...



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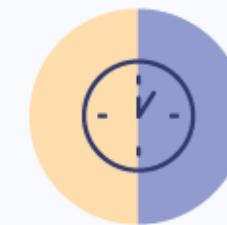
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# KELVIN

(CORRELATED COLOR TEMPERATURE)



## CORRELATED COLOR TEMPERATURE (CCT)

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# LIGHTING ORDINANCE

keep it dark

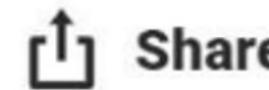
# WHERE TO FIND THIS LIGHTING?

DarkSky Approved program

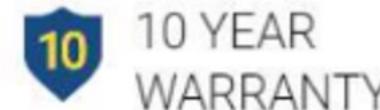


Certified by [DarkSky.org](https://DarkSky.org)

# OSQ™ Series



**The OSQ Series Flood luminaire blends extreme optical control, advanced thermal management and modern aesthetics.** The rugged cast aluminum housing is built to last with a weathertight LED driver compartment. Versatile mounting options offer simple installation. Its slim low-profile design minimizes wind load requirements and blends seamlessly.



10 YEAR  
WARRANTY



IDA  
DARK SKY  
APPROVED



DLC  
PREMIUM



90+  
HIGH CRI  
OPTIONS



LPW  
HIGH  
EFFICACY  
OPTIONS



T  
VERSATILE  
MOUNTING



OSQ™ LED Area/Flood Luminaire featuring Cree TrueWhite® Technology - Series 1									
Product Specification									
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# WHO WE ARE



**DarkSky**  
**INTERNATIONAL**

The **DarkSky International** protects the night from light pollution and promotes responsible outdoor lighting.

# THANK YOU!

[nmdarksky.org](http://nmdarksky.org)

