

Artificial Light at Night Impacts to Birds and other Animals

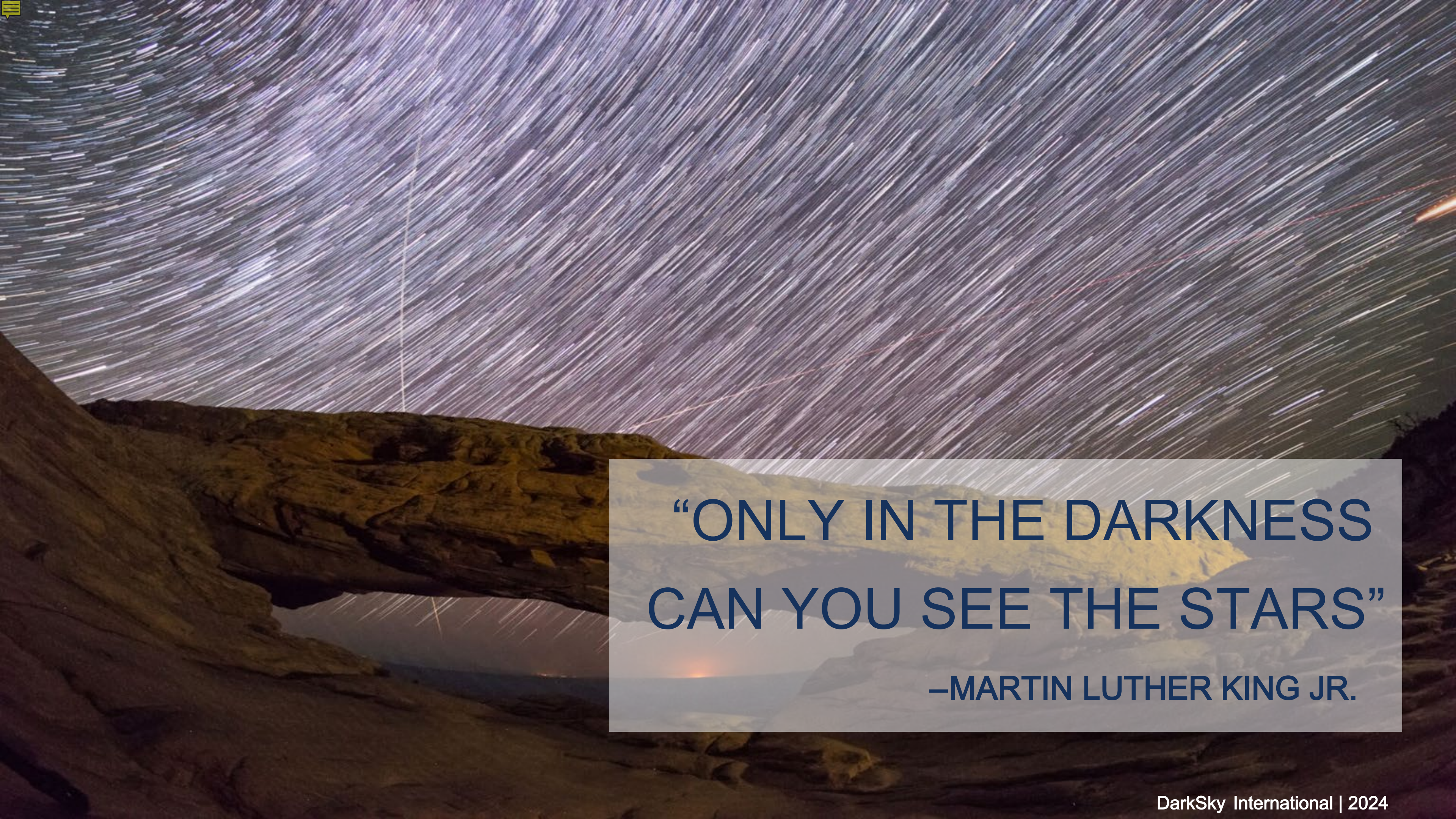
Trish Cutler

State Council

NM Chapter of DarkSky International



DarkSky
INTERNATIONAL

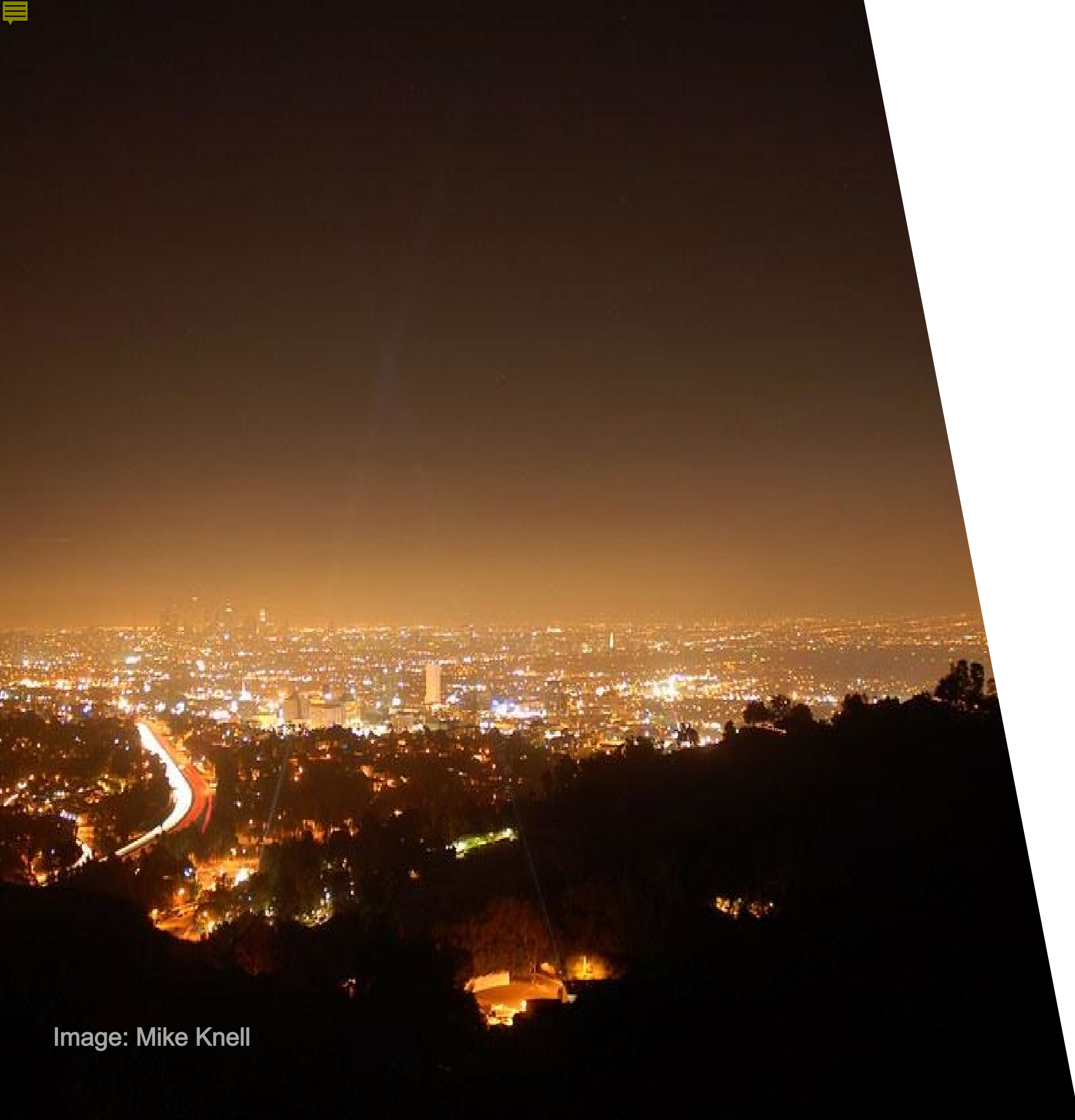


“ONLY IN THE DARKNESS
CAN YOU SEE THE STARS”

—MARTIN LUTHER KING JR.



Light pollution is increasing at 9.6% per year*



LIGHT POLLUTION

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



SKYGLOW



GLARE



LIGHT TRESPASS



LIGHT POLLUTION CONSEQUENCES

ECOLOGICAL IMPACTS

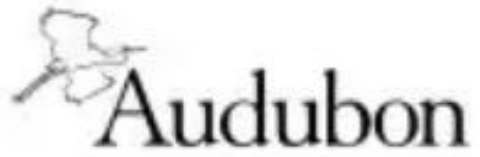
Most Bird Species in North America are Migratory

70%

of terrestrial recurring birds are migratory.

80%

of those birds migrate at night.



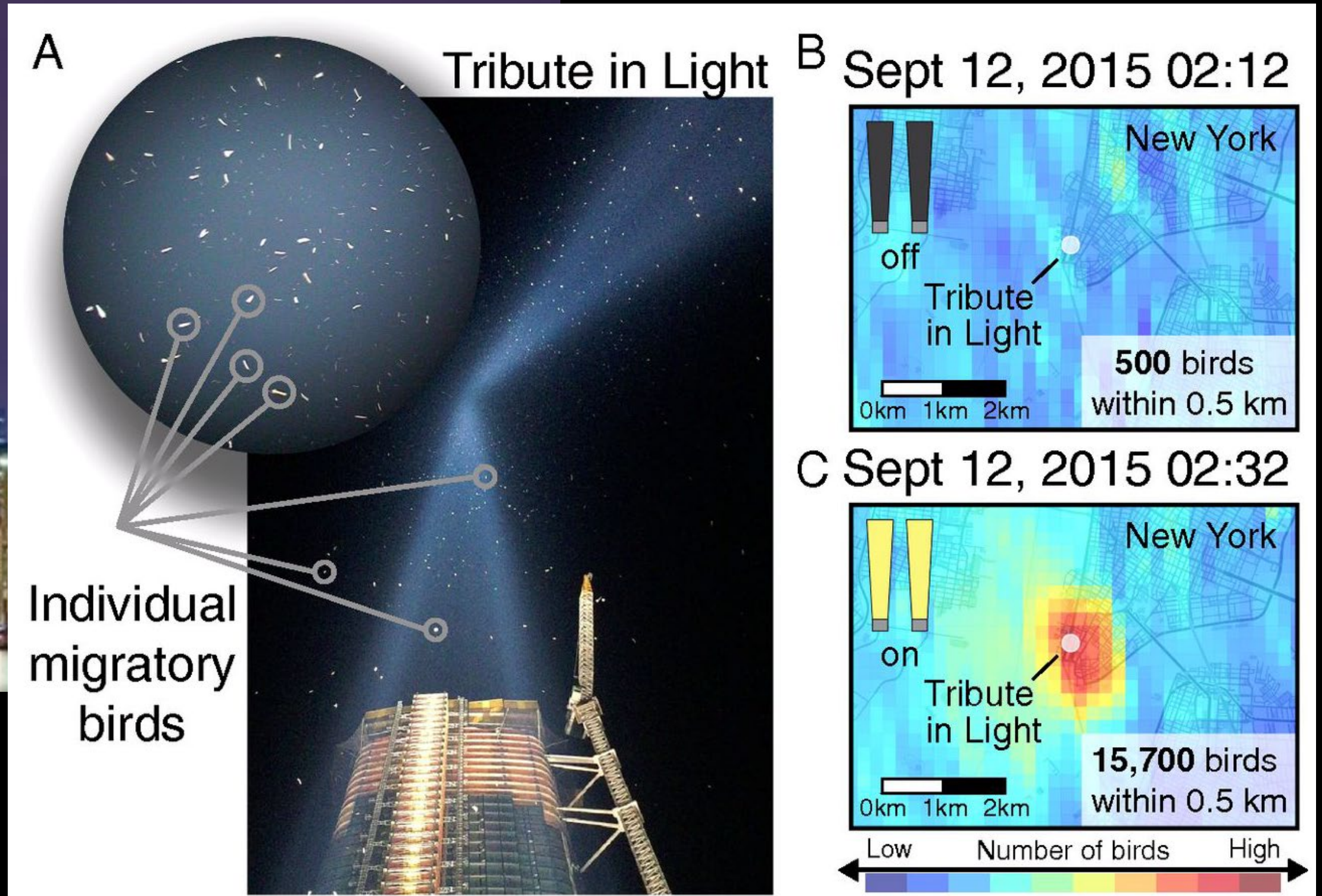
Spring/Fall Bird Migration

- 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.

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,

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.

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 CO₂

burned by unnecessary lighting

HUMAN HEALTH

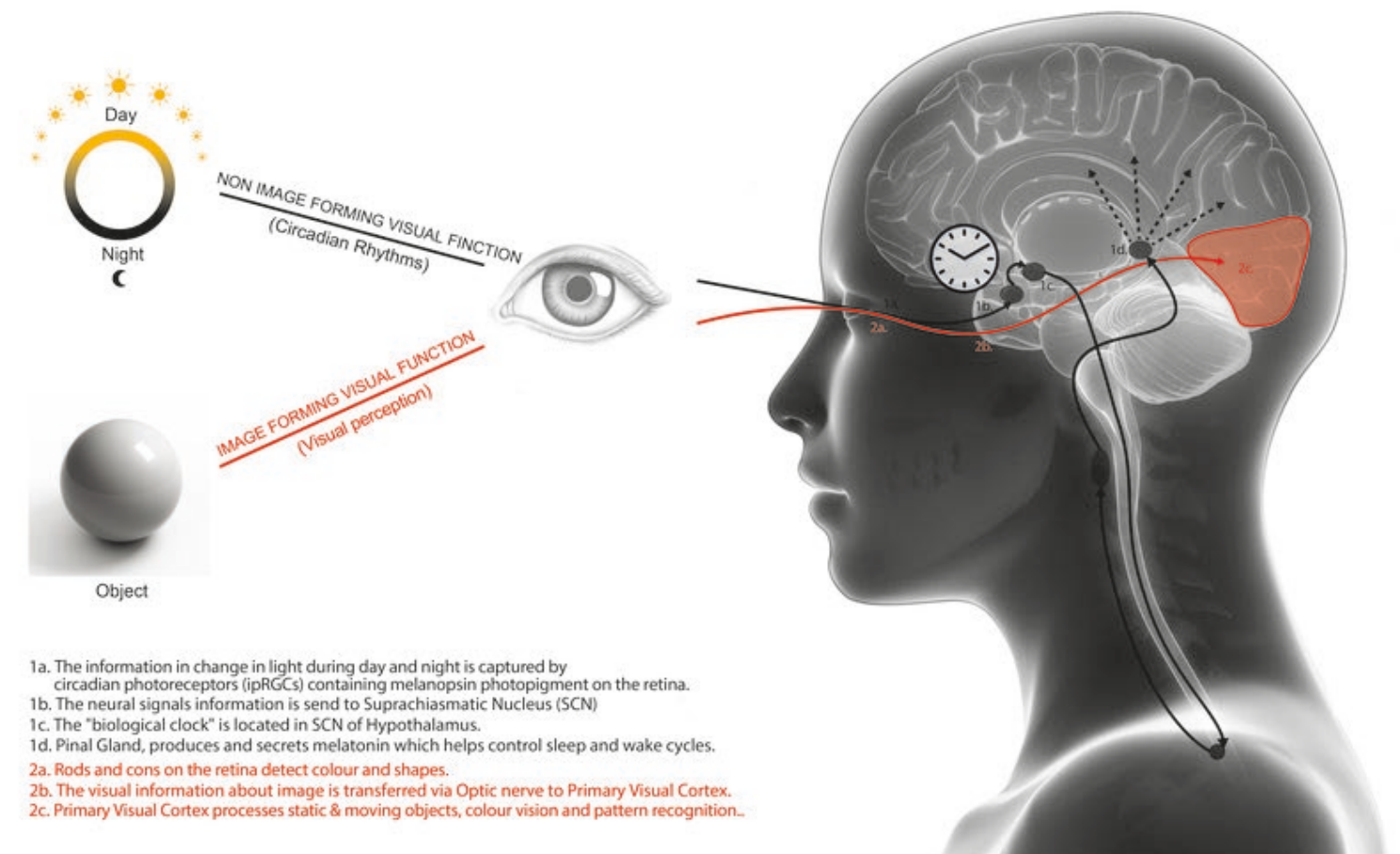
Disability Glare results in decreased visual acuity and reduced driving visibility.

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.

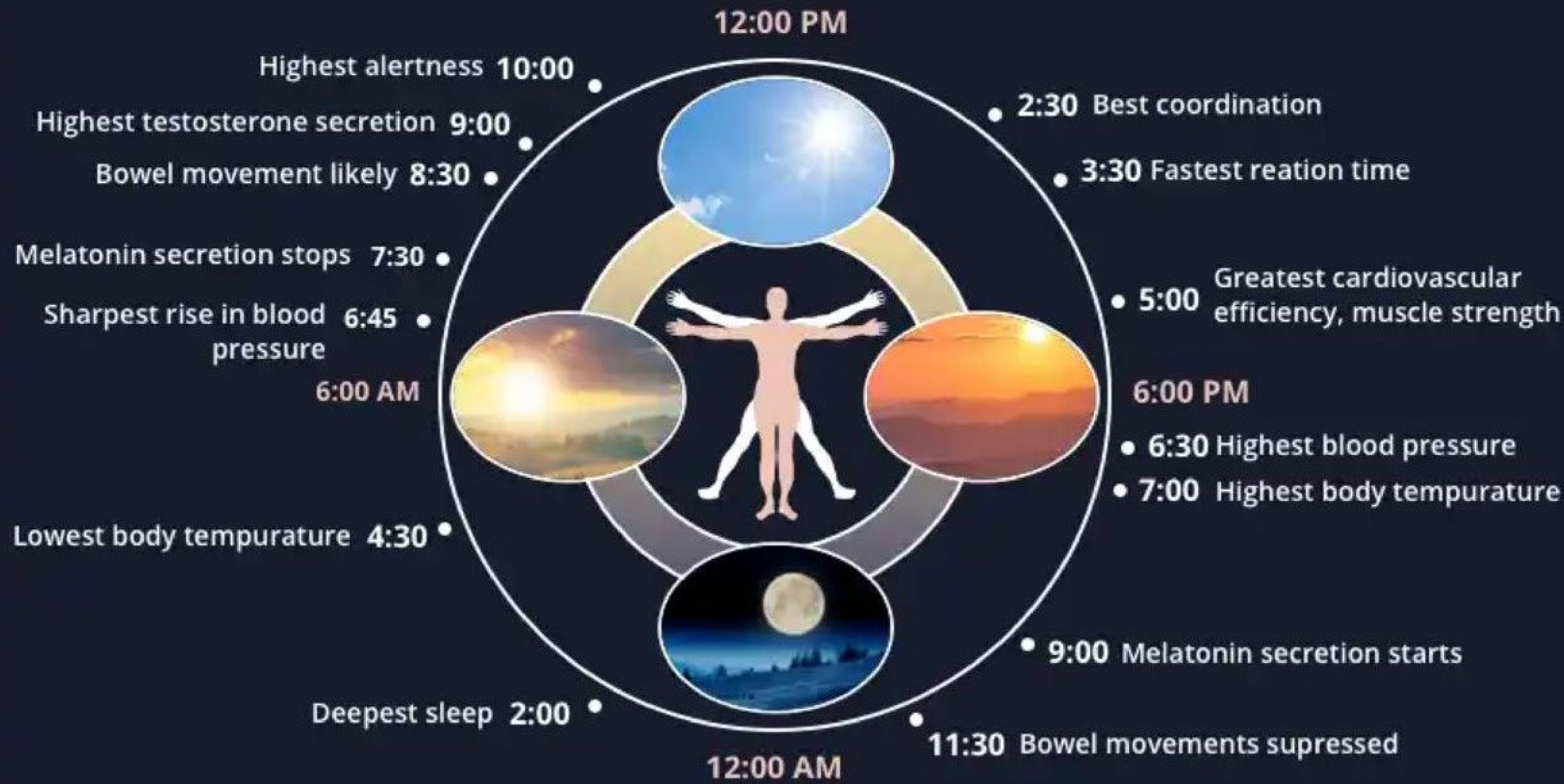
Eye Damage: Blue wavelengths create more scattering of light in the human eye and potential damage to retinas.

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 nighttime illumination including a London case study.



SAFETY AND SECURITY



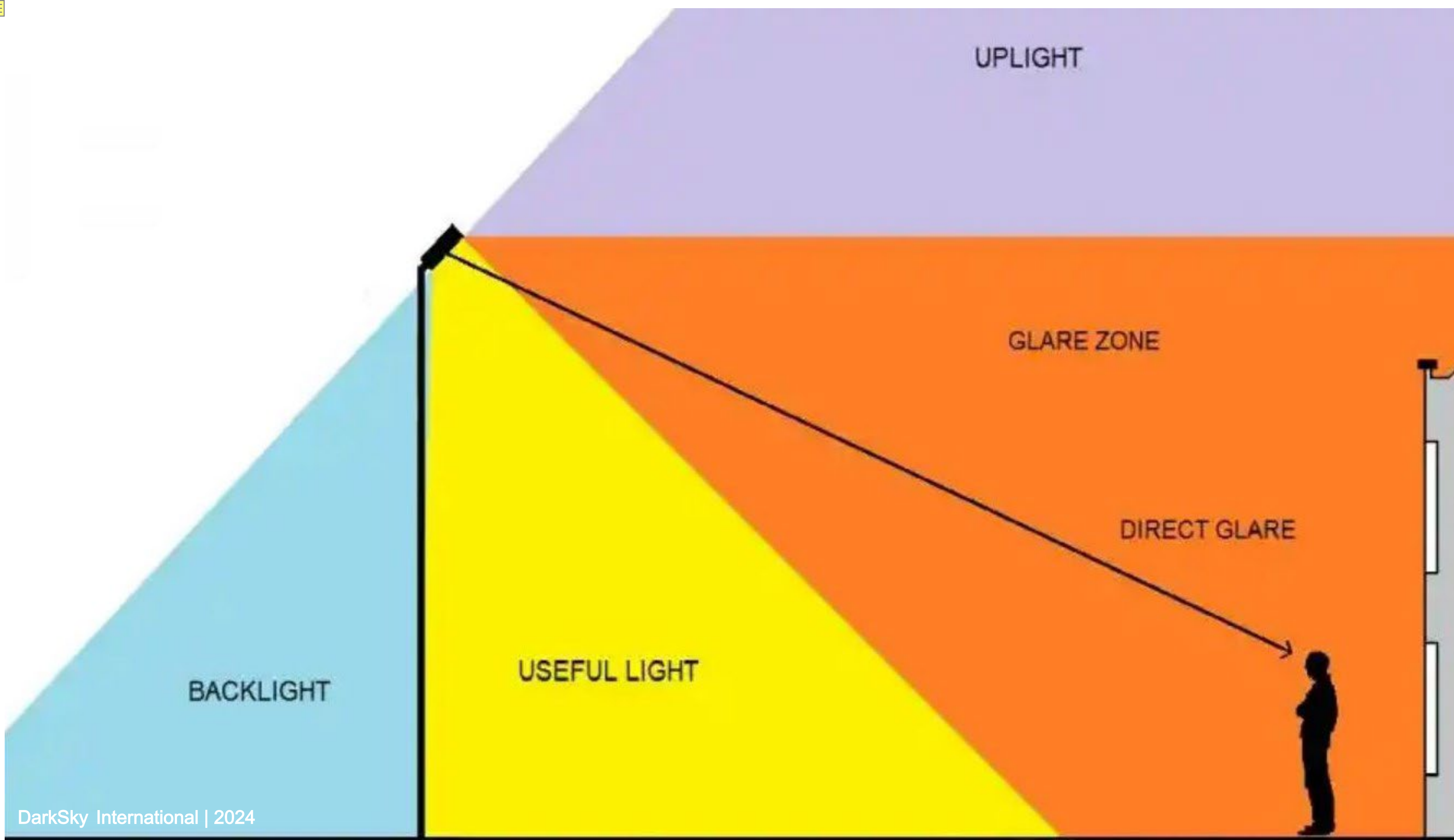
**MYTH: MORE
LIGHTING IS SAFER**



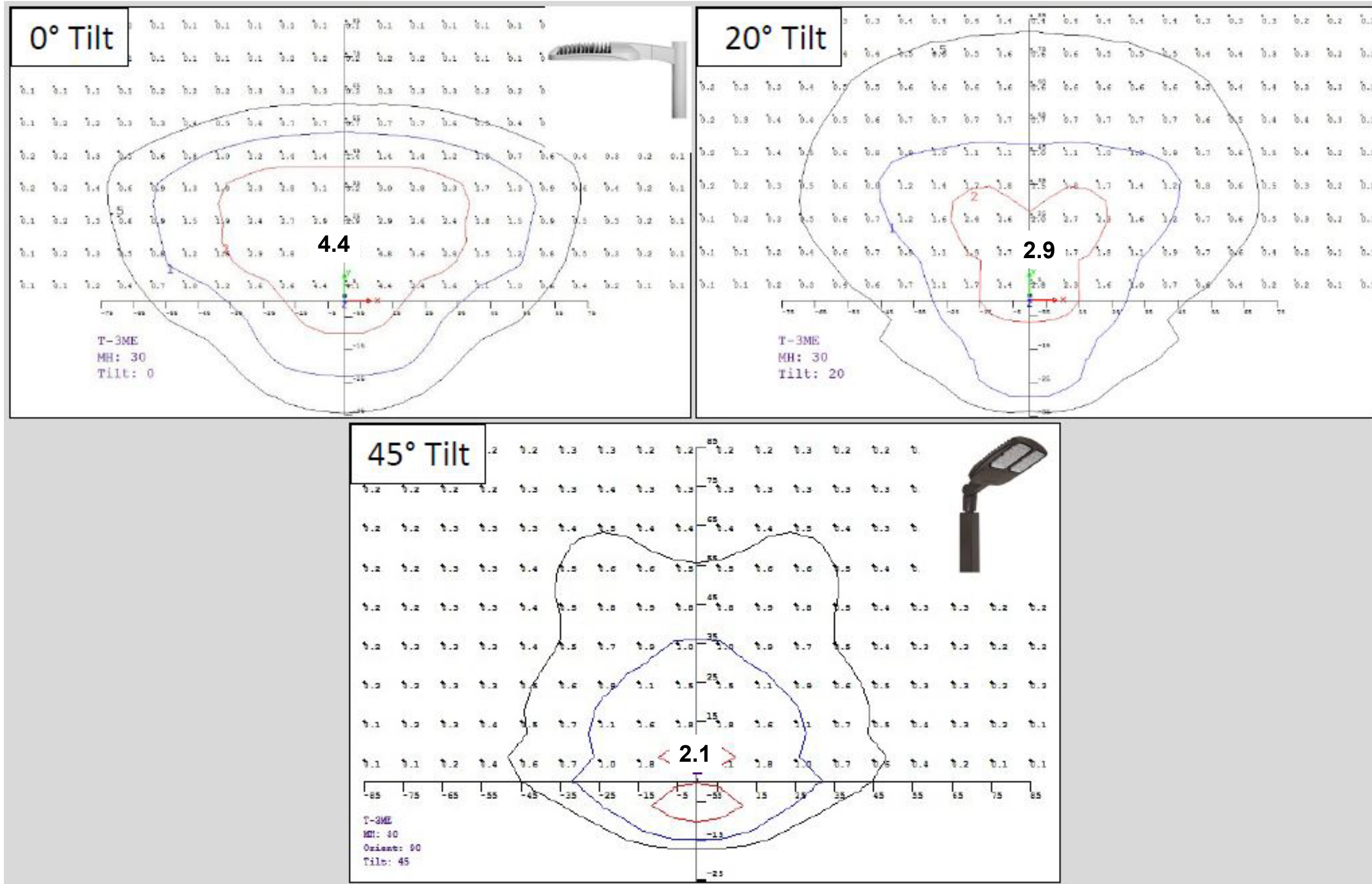
**REALITY: WELL DESIGNED
LIGHTING IS SAFER**



THE SOLUTION: BETTER LIGHTING DESIGN



Tilt Creates Poor Quality Light on the Ground



Five Lighting Principles for Responsible Outdoor Lighting



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

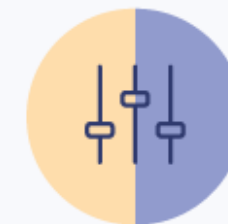
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3 Low Level

Light should be no brighter than necessary

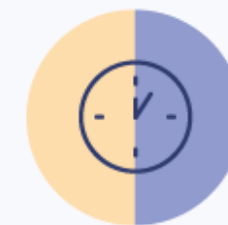
Use the lowest light level required. Be mindful of surface conditions, as some surfaces may reflect more light into the night sky than intended.



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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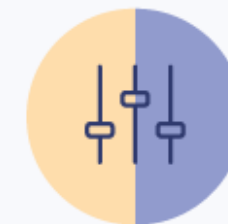
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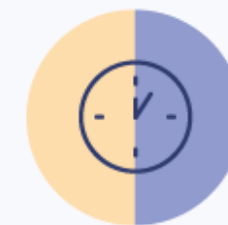
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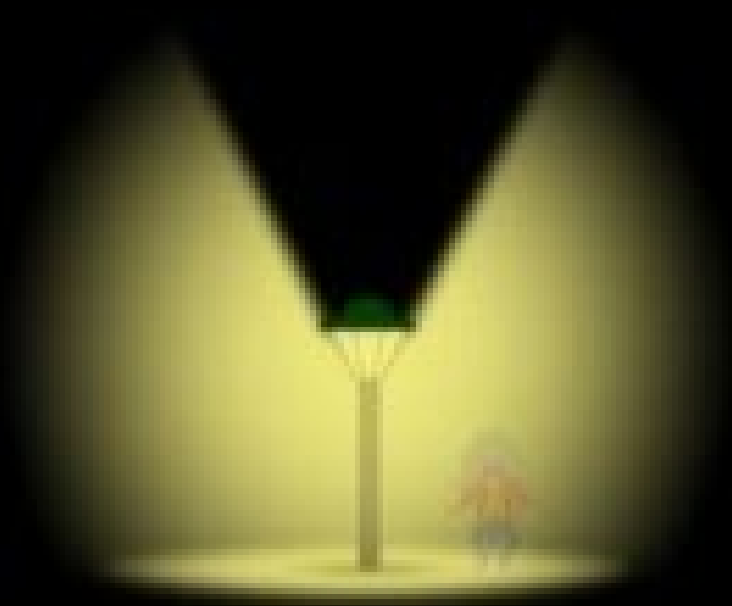


worse

bad

good

better



Bill Wren/McDonald Observatory

Non-cutoff

Semi-cutoff

Cutoff

Full-Cutoff²⁶



BAD



GOOD



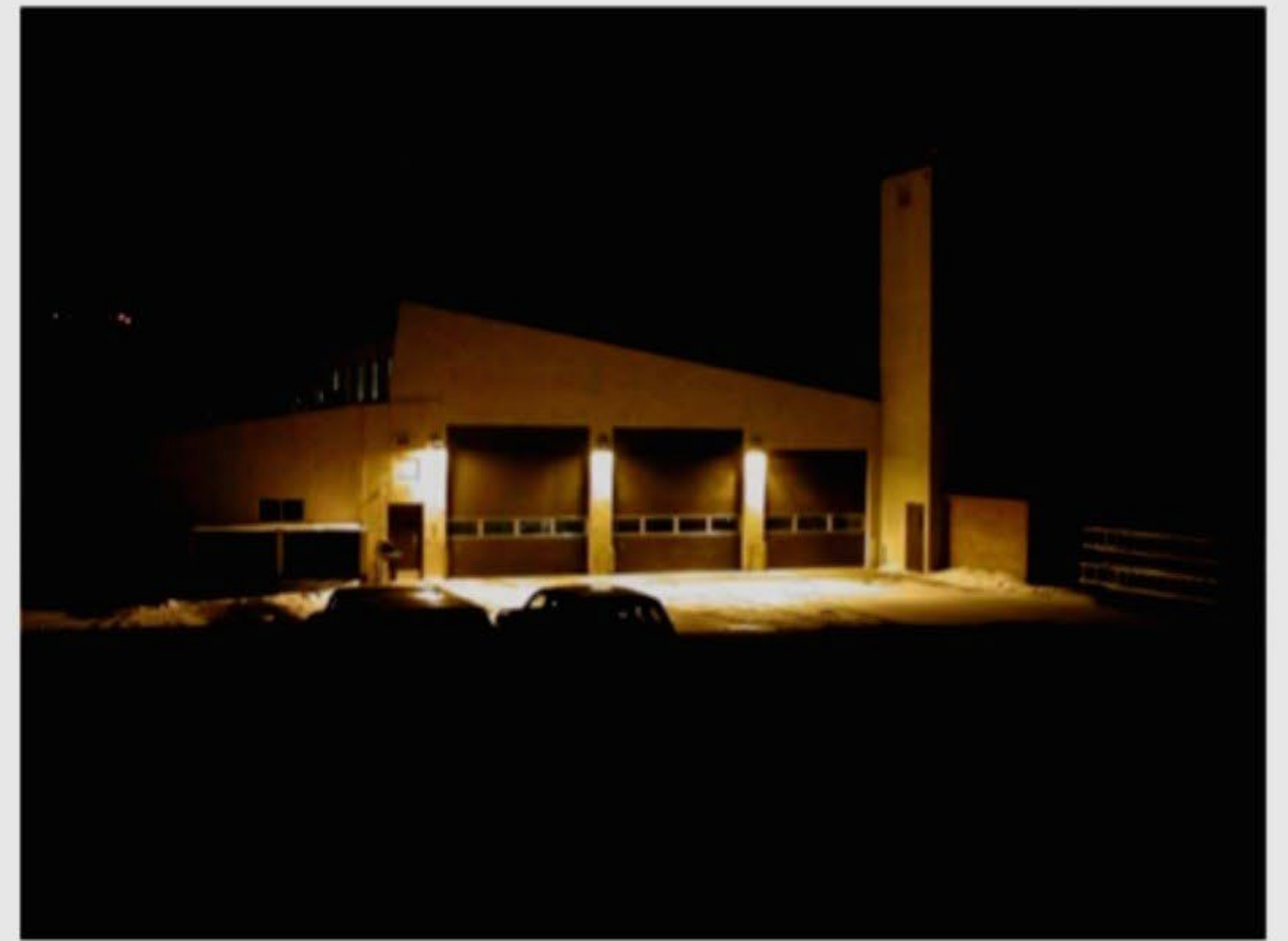
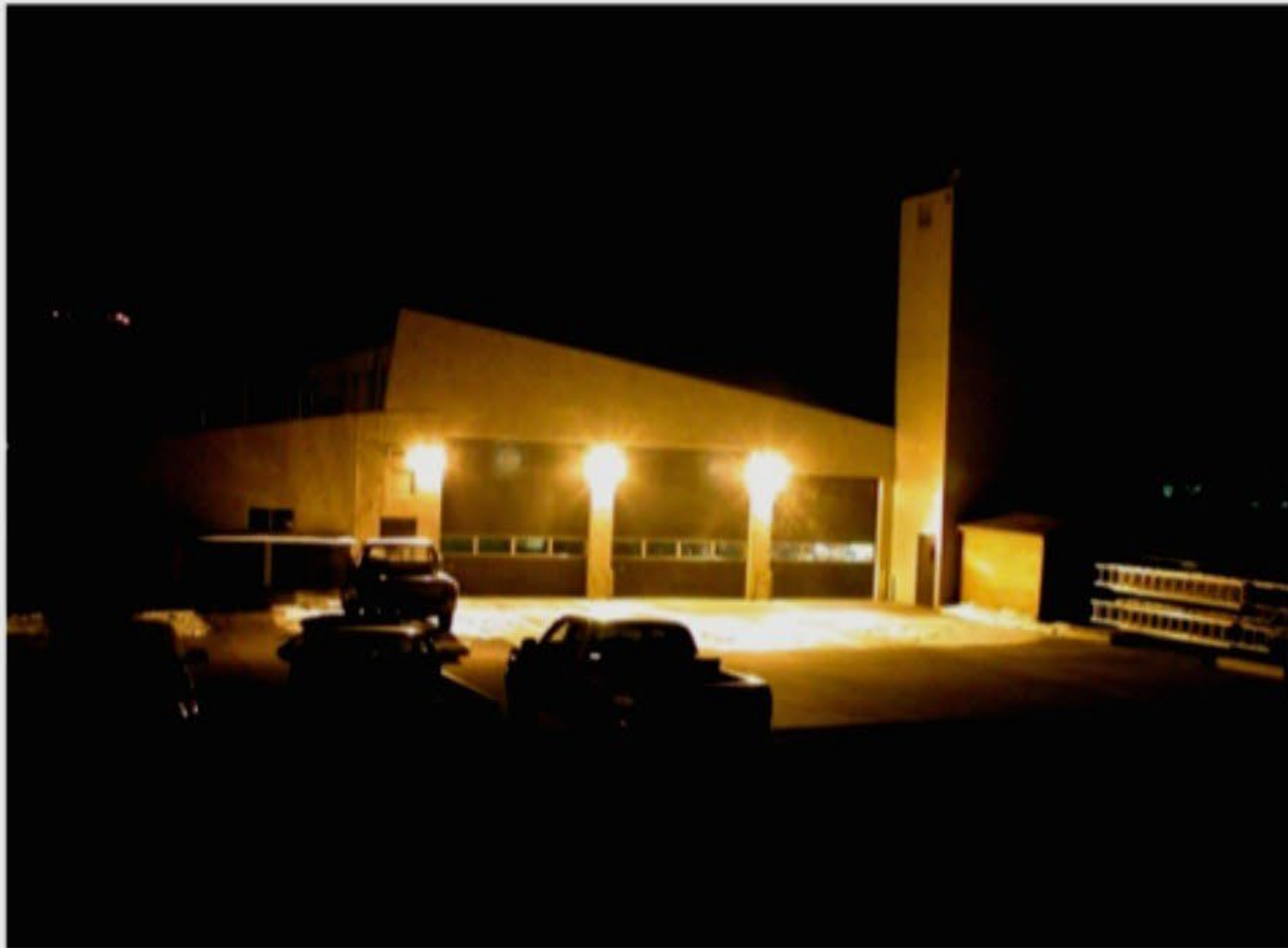
BAD



GOOD



Positive Effects of Shielding



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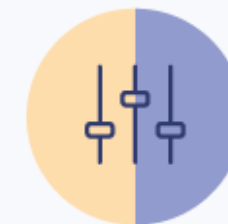
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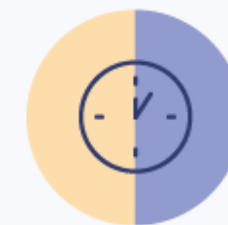
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INTENSITY



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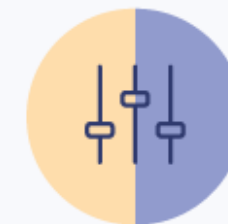
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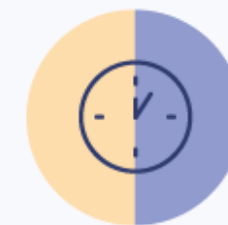
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We need to move beyond the **photo-cell** to more sophisticated controls...



Switches

CONTROLS



Timers



Dimmers & Motion Sensors

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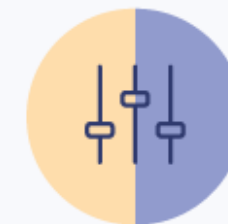
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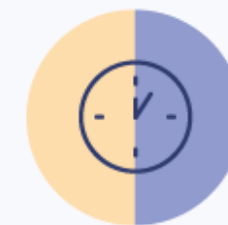
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KELVIN

(CORRELATED COLOR TEMPERATURE)

2700K

Warm White

- 2700-3000K
- Most similar to incandescents
- Inviting, relaxing

3000K

Bright White

- 3500-4100K
- Energetic, lively
- Good for kitchens and workspaces

4500K

Daylight

- 5500-6500K
- Crisp and refreshing
- Good for reading

6500K

CORRELATED COLOR TEMPERATURE (CCT)

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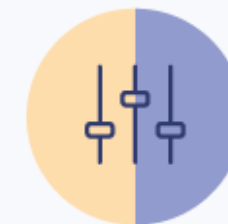
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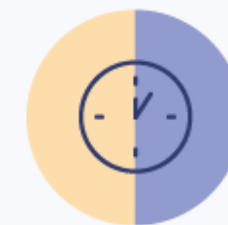
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LIGHTING ORDINANCE

keep it dark

WHERE TO FIND THIS LIGHTING?

DarkSky Approved program



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



WHO WE ARE



DarkSky
INTERNATIONAL

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

THANK YOU!

nmdarksky.org

