

The Impact of Light Pollution

Brief History of Light Bulb Useage

Light Science 101

Health Concerns – Birds, Bees & Peeps

Safety – Home Security and Driving

Economic Incentives

The Impact of Light Pollution

Brief History of Light Bulb Useage

Light Science 101

Health Concerns – Birds, Bees & Peeps

Safety – Home Security and Driving

Economic Incentives

Light Pollution



- Light pollution is defined as the illumination of the night sky caused by artificial light
- A problem born with the invention of the light bulb only 125 years ago.
- 80% of Americans cannot see the Milky Way from their backyards

Common Light Bulbs

Incandescent



Low P Sodium



High P Sodium



We have become very energy efficient at illuminating the night!!

Halogen



CFL



LED



Use 30% less energy than incandescent
Last 3X as long

Use 75% less energy than incandescent
Can last up to 10 years

Use 85% less energy than incandescent
Can last up to 25 years

Light pollution & human health

Study: Sensitivity of the human circadian system to short-wavelength light.

Source: Journal of Biological Rhythms (2008)

Conclusion: Exposure to light at night resulted in a reduction in melatonin levels which negatively impacted the natural wake-sleep cycle.



Study: The relationship between obesity and exposure to light at night.

Source: Journal of Epidemiology (2014)

Conclusion: Odds of obesity increased with increasing exposure to light at night.



The Impact of Light Pollution

Brief History of Light Bulb Useage

Light Science 101

Health Concerns – Birds, Bees & Peeps

Safety – Home Security and Driving

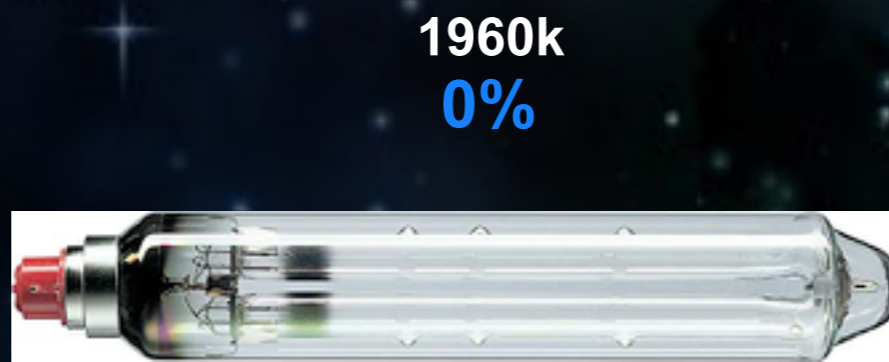
Economic Incentives

Bulb Use History - % Blue Light

Incandescent



Low P Sodium



High P Sodium



Halogen



CFL



LED

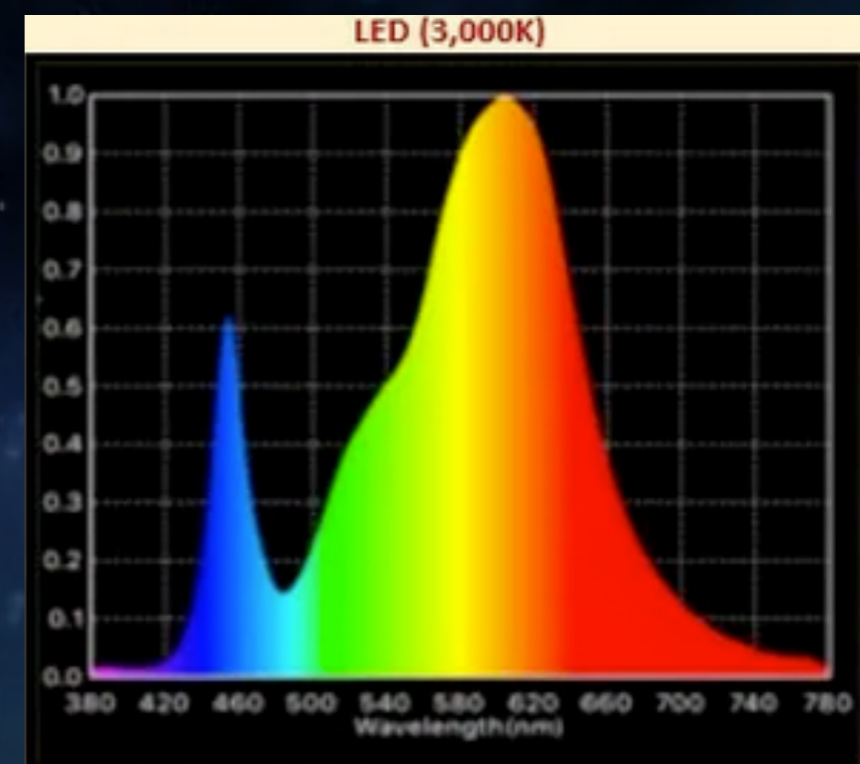
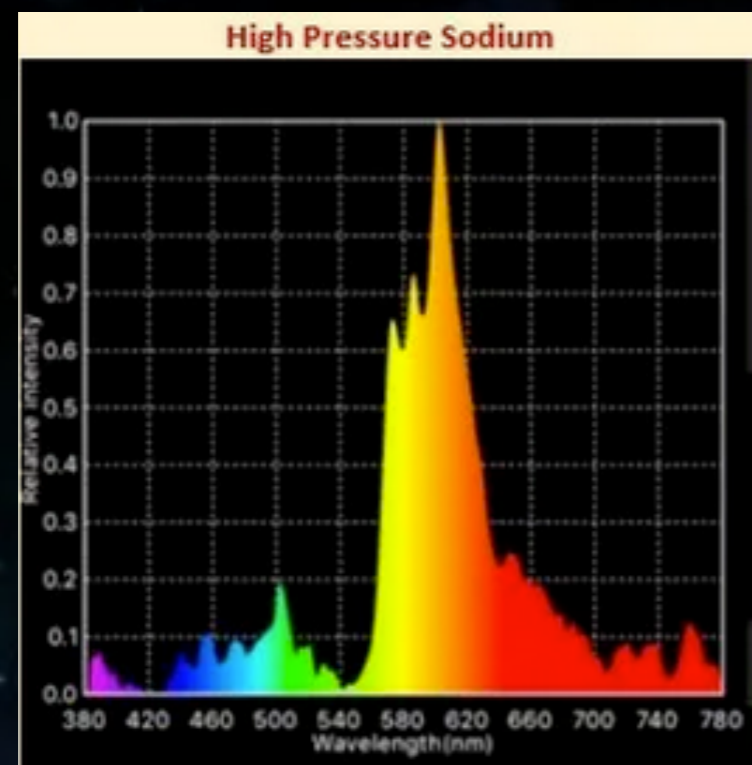


Use 30% less energy than incandescent
Last 3X as long

Use 75% less energy than incandescent
Can last up to 10 years

Use 85% less energy than incandescent
Can last up to 25 years

HPS Vs. LED



The Impact of Light Pollution

Brief History of Light Bulb Useage

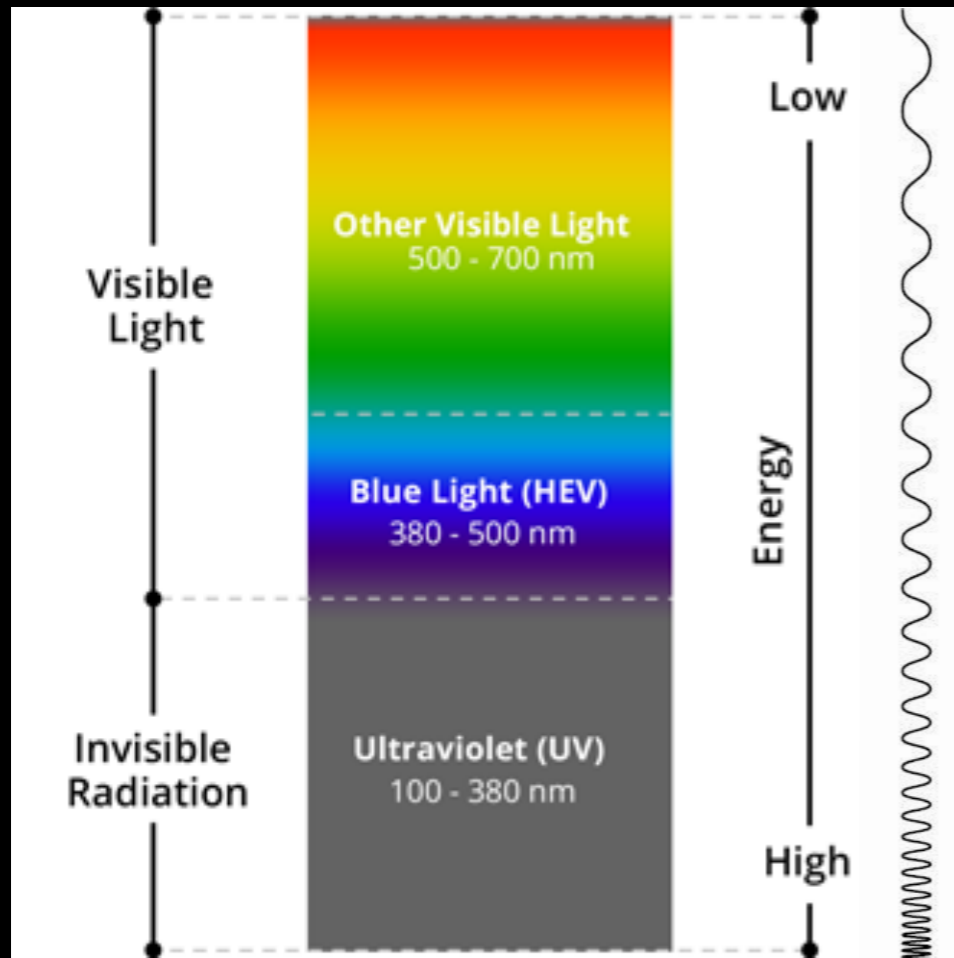
Light Science 101

Health Concerns – Birds, Bees & Peeps

Safety – Home Security and Driving

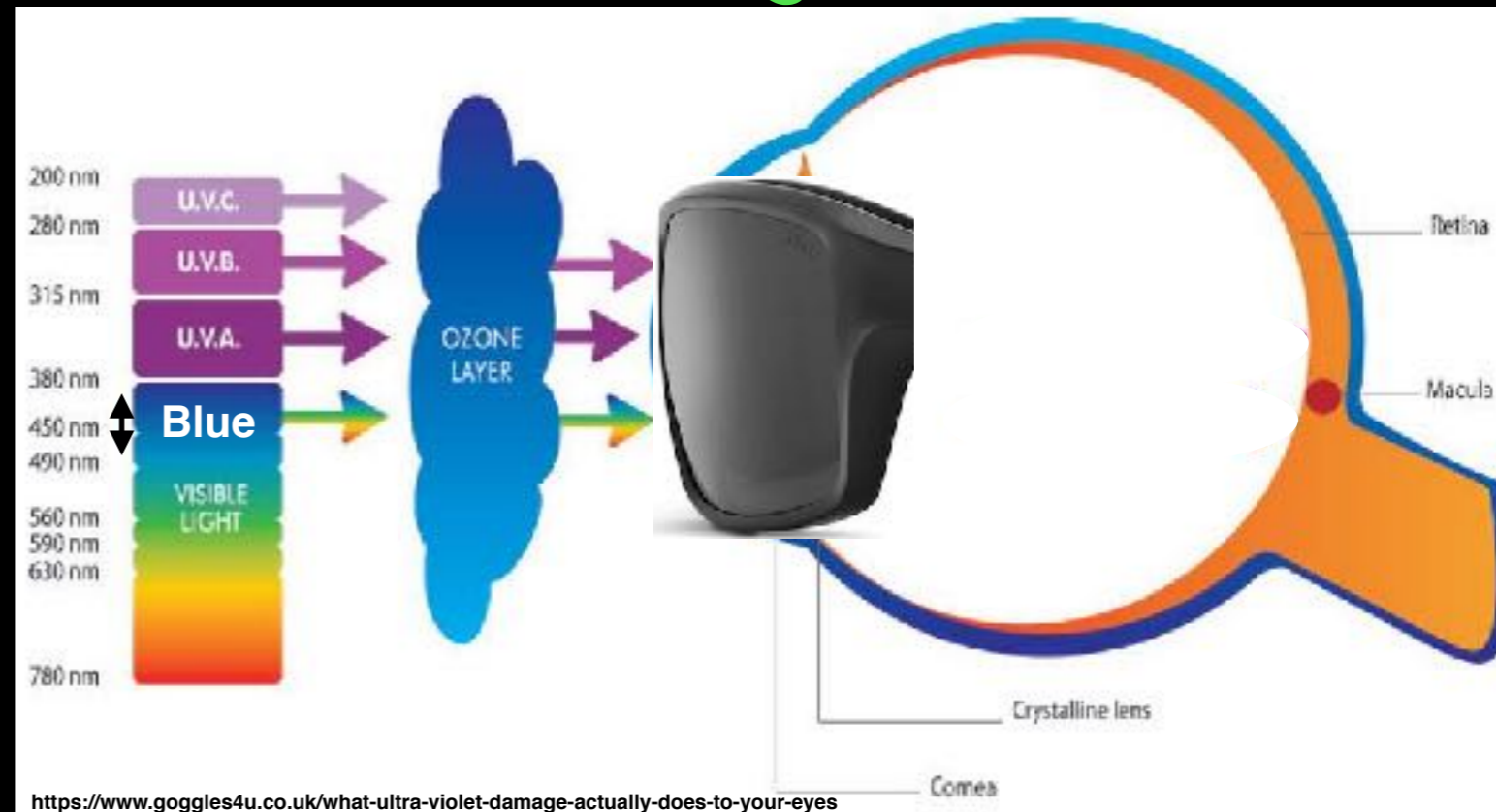
Economic Incentives

How Does Blue Light Affect US?



<https://www.allaboutvision.com/cvs/blue-light.htm>

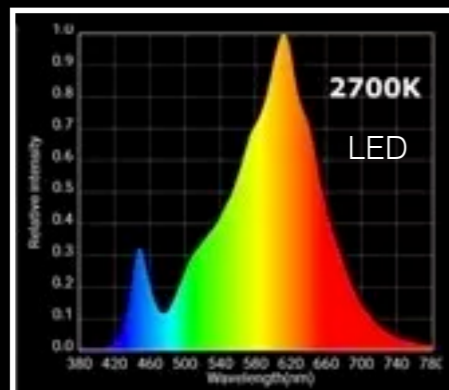
Blue light is at the higher energy portion of the visible spectrum. It scatters easily when it strikes particles like dust and water vapor.



<https://www.goggles4u.co.uk/what-ultra-violet-damage-actually-does-to-your-eyes>

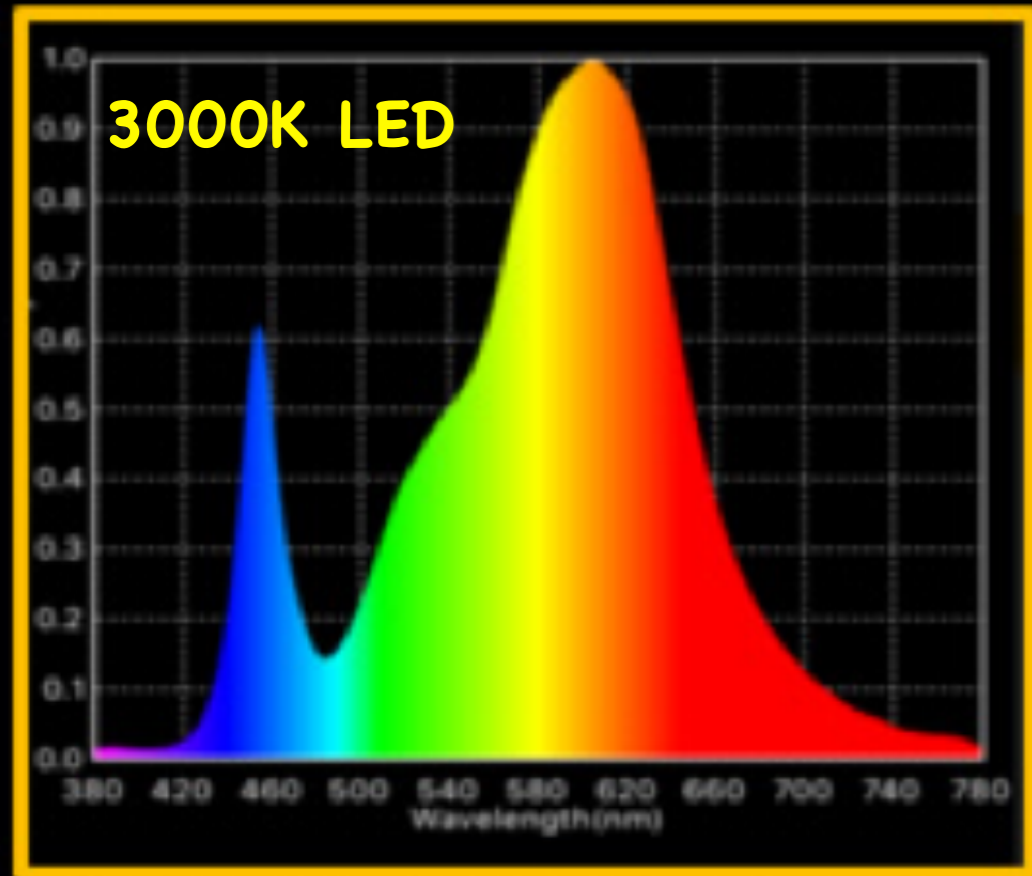
It enters our fluid filled eyes and reflects off the interior walls of the eye and impacts our ability to see clearly.

It penetrates the macular pigment and harms the retina.

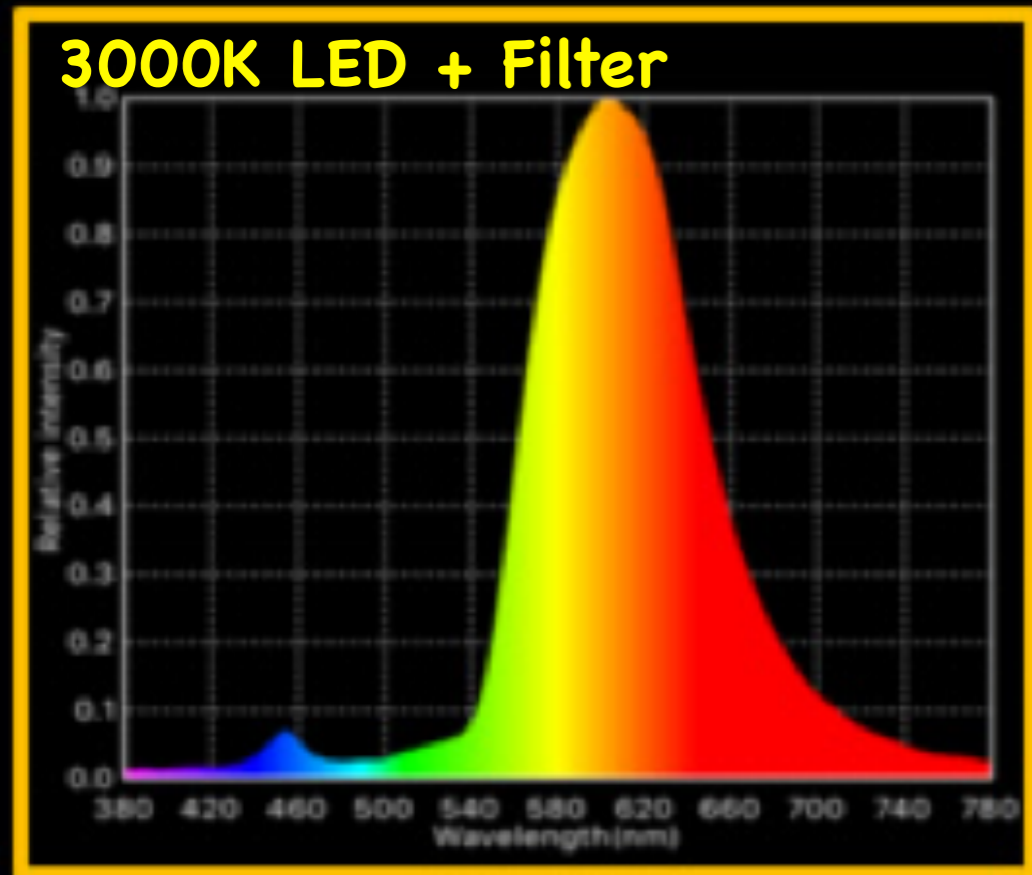
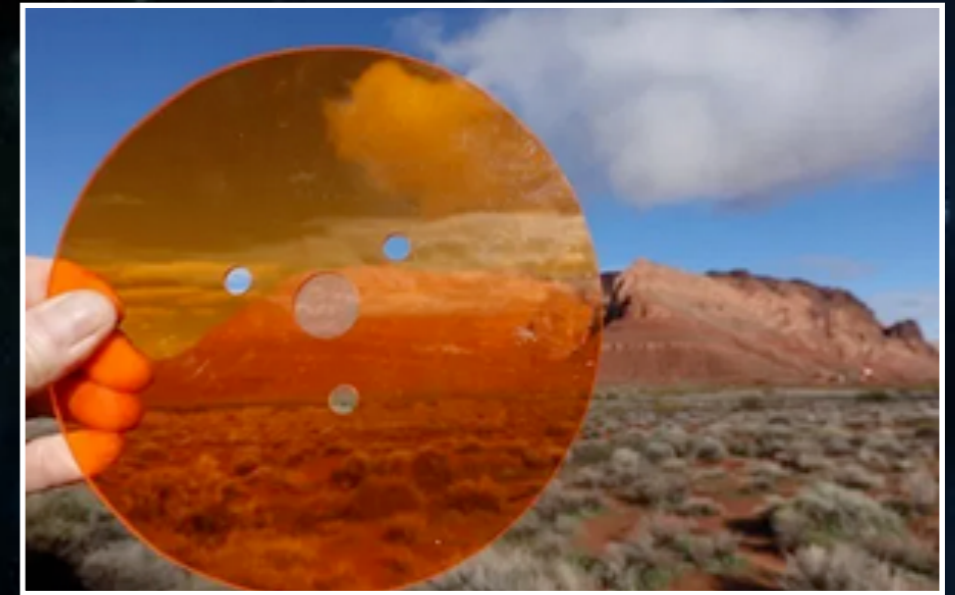


Fully shielded fixtures do not protect us from the scattering of these wavelengths

Ivins City Retrofit to Eliminate Blue Light



A 3000K LED emits a lot of blue light



This filter eliminates almost all of the harmful blue light (3000K LED + Amber Filter)

Light pollution & human health

2016 AMA study recommends minimizing blue light exposure to reduce the risk of chronic disease



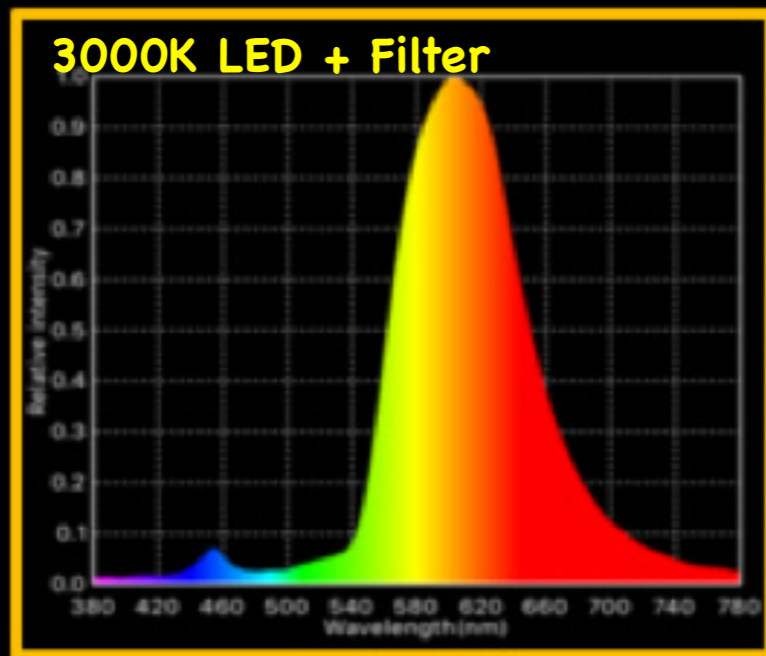
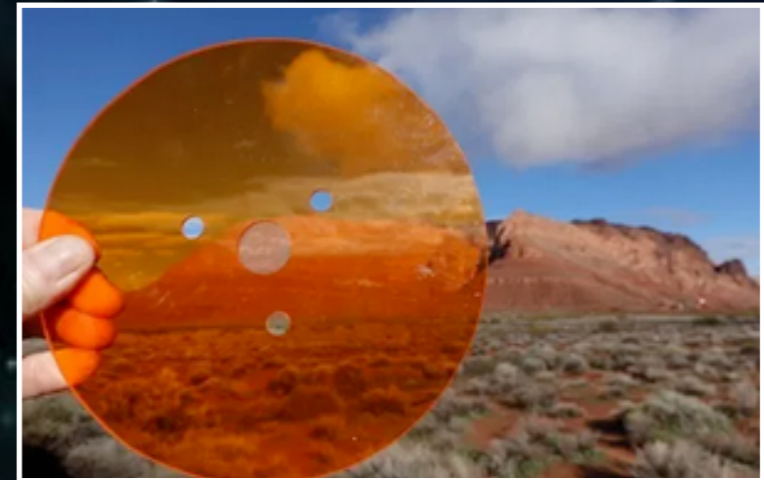
Harvard Medical Study – Blue light contributes to macular degeneration, glaucoma and retinal degenerative diseases



American Macular Degeneration Foundation – Blue light accelerates age-related macular degeneration



HPS Vs. LED



Change Your Device Preferences

Spectra for the Night Shift Off, Middle, and Maximum Settings

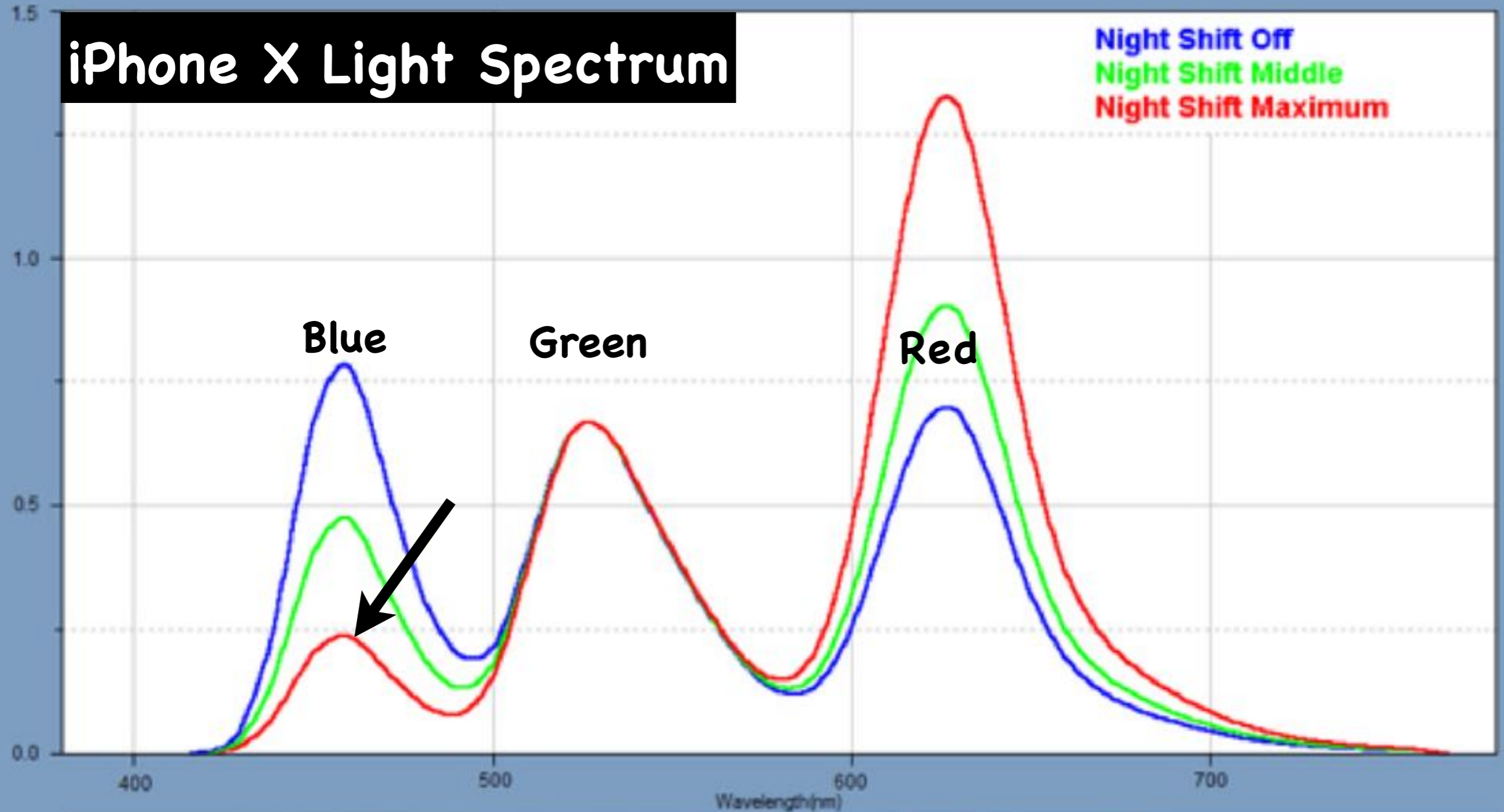
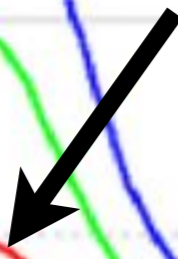
iPhone X Light Spectrum

Night Shift Off
Night Shift Middle
Night Shift Maximum

Blue

Green

Red



http://www.displaymate.com/Spectra_41a.html

<https://www.cwenergyusa.com/blog/how-does-blue-light-impact-humans>

Light pollution & human health

Scientists are just beginning to understand the negative impacts on health.

The circadian clock affects important physiologic processes.

Disruption of these processes are associated with:

Sleep Disorders

Psychiatric Disorders

Cardiovascular Diseases

Immunological Disorders

Metabolic Disorders

Obesity

Cancer Progression

Vision Disease Progression

Dr. Maya Angelou



"Do the best you can until you know better.

Then when you know better, do better."

Light Pollution Impacts Birds



Millions of birds die each year from collisions with brightly lit buildings and towers.

The light confuses them and interferes with their migration.

In light polluted areas, birds continuously chirp throughout the night.

This disrupts their sleep patterns, preventing them from resting.

Light Pollution Impacts Insects



Fireflies lose their ability to seek and find mates using their own much dimmer bio-luminescence.

Moths and other insects are relied upon to pollinate crops.

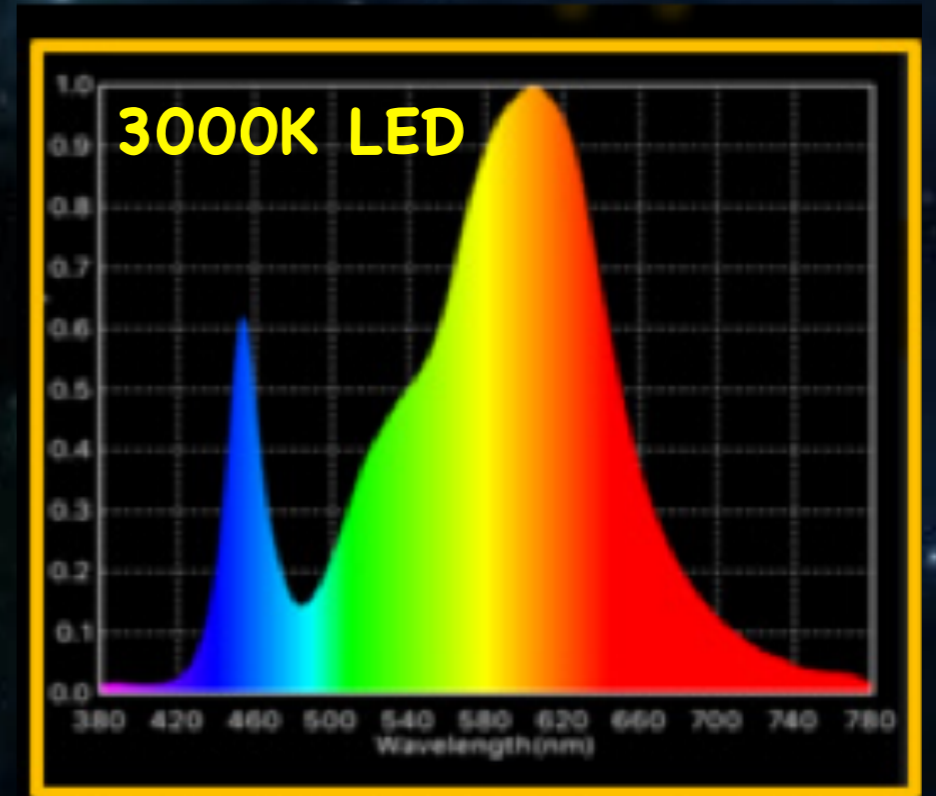
Bright lights attract insects away from the crops which make them easy prey for bats.

Crops yields are reduced.

Amber shielded fixtures do not attract insects !!

After 1 year

Photo Courtesy of Wilson Jimenez



After 1 year

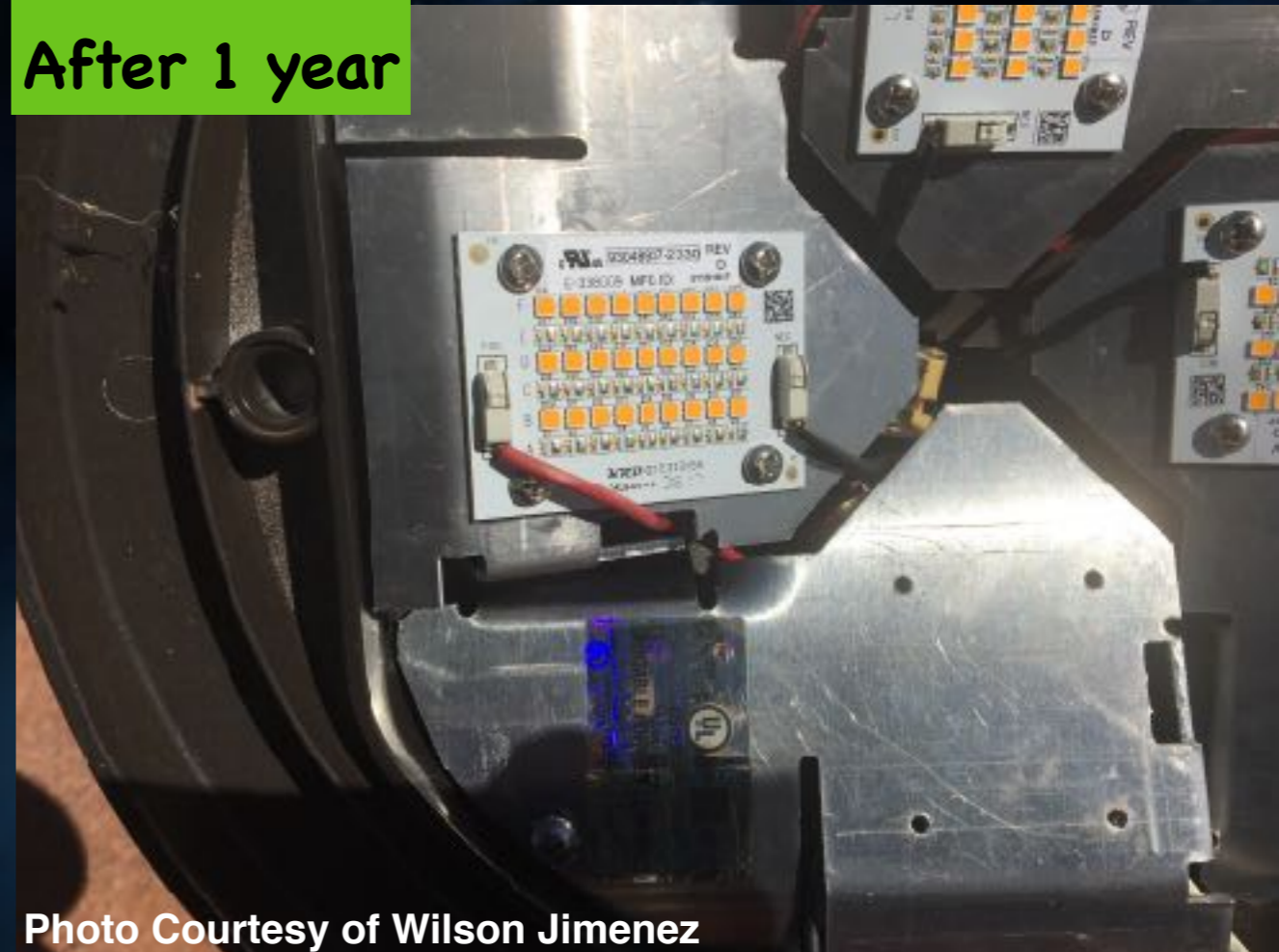
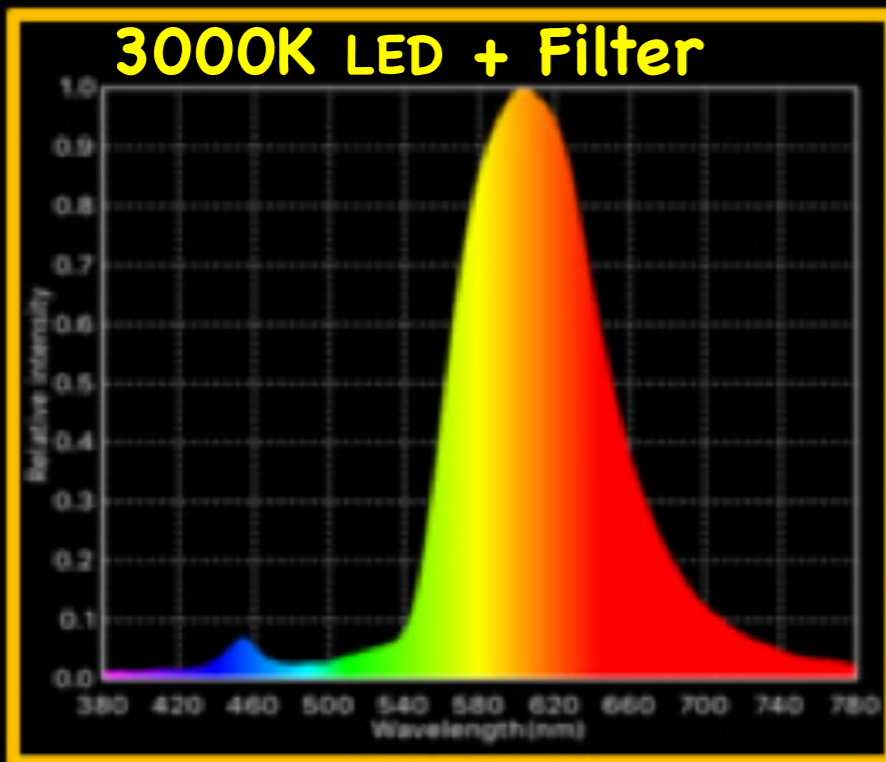


Photo Courtesy of Wilson Jimenez



Light Pollution Impact - Wildlife

Too much artificial light at night affects the wildlife that share our neighborhoods with us.

Light pollution impacts:

Migration Patterns

Sleep Quality

Foraging

Reproduction

Increased Exposure to Predators

The Impact of Light Pollution

Brief History of Light Bulb Useage

Light Science 101

Health Concerns – Birds, Bees & Peeps

Safety – Home Security and Driving

Economic Incentives

What about Home Security ??

Is there clear scientific evidence that increased outdoor lighting deters crime?

Does it just make us feel safer?

Brighter Does Not Mean Safer

The Chicago Alley Lighting Project: Final Evaluation Report

April 2000

Prepared by

Erica N. Morrow
Shawn A. Hutton
Research and Analysis Unit
Illinois Criminal Justice Information Authority

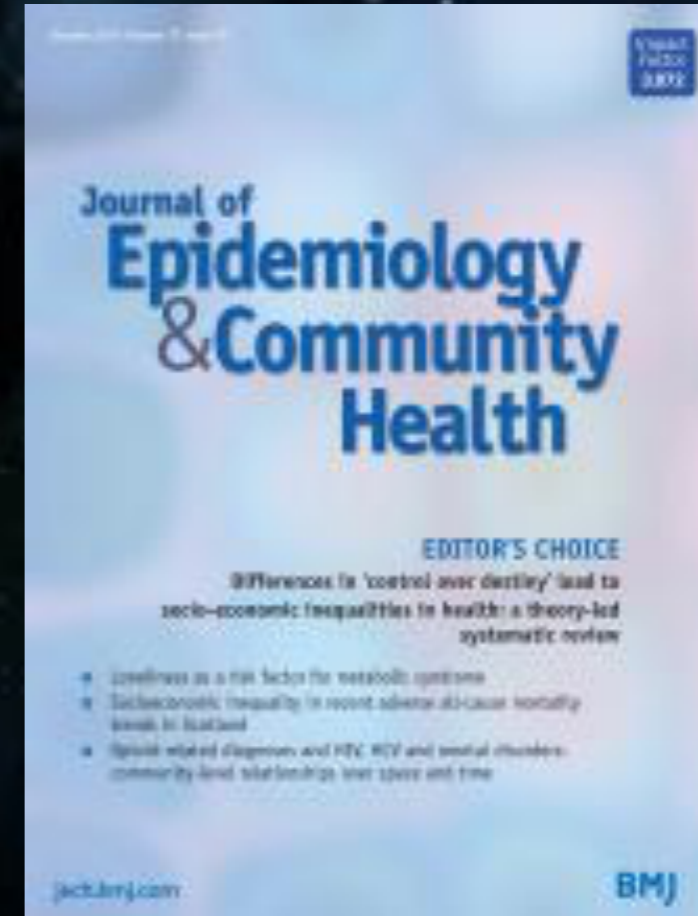
George H. Ryan, Governor
Peter B. Bensinger, Chairman
Candice M. Kane, Executive Director



ILLINOIS
CRIMINAL JUSTICE
INFORMATION AUTHORITY

120 South Riverside Plaza • Suite 1016 • Chicago, Illinois 60606 • (312) 703-8550

Correlation between brightly lit alleyways and increased crime.



2015

The effect of reduced street lighting on road casualties and crime in England and Wales: controlled interrupted time series analysis

Rebecca Steinbach,¹ Chloe Perkins,² Lisa Tompson,³ Shane Johnson,³
Ben Armstrong,¹ Judith Green,⁴ Chris Grundy,¹ Paul Wilkinson,¹ Phil Edwards²

Authorities can safely reduce street lighting without impacting safety and crime adversely. "We have little confidence that improved/brighter lighting prevents crime."

What about security?



Glare creates deep shadows. It shines into your eyes, constricting your pupils. This diminishes your eyes' ability to adapt to low-light conditions.

Retrofit Idea - St. George, UT



Do you want to see better while you're driving ?



Before

George Fleenor

Our desire to become a Dark Sky not a Dark Ground Community

After



George Fleenor

The Impact of Light Pollution

Brief History of Light Bulb Useage

Light Science 101

Health Concerns - Birds, Bees & Peeps

Safety - Home Security and Driving

Economic Incentives

Energy Savings

Saving energy makes economic sense.

The International Dark-Sky Association in Tucson, Arizona, estimates that one-third of all lighting in the U.S. is wasted.

Annual cost of about U.S. \$3.3 billion equating to 55 million barrels of oil or 49 million tons of coal.

Saving energy also keeps our air cleaner as 70% of our electricity in Utah is generated from coal.

Dark Skies Enhance our Property Values

People want to escape what is called "Brightness Blight"

Some areas of the western US use dark skies as a key selling point.

Incorporating a dark sky ordinance into their designs has contributed to the developments overall attractiveness.

Sedona, AZ listing - "Private sunbathing during day - incredible red rock views and Dark Sky telescope observations at night!"

Dark Skies Enhance our Property Values

In Colorado, a development called Summit Sky Ranch is building dark-sky preservation standards into the community's overall design, including streetlights and an observatory. Home prices start around \$950,000 compared to Denver's median home price of \$410,000.



Dark Skies Enhance our Property Values

In Colorado, a development called Summit Sky Ranch is building dark-sky preservation standards into the community's overall design, including streetlights and an observatory. Home prices start around \$950,000 compared to Denver's median home price of \$410,000.



<https://summitskyranch.com/amenities/>

The collaborative efforts of the City, INSI volunteers, citizens and businesses is not just about preserving the night sky,

It's also about preserving and protecting our health and safety.





FINI

<https://ivinsnightsky.org>