Light Pollution in Princeton

Gaspar Bakos, gbakos@astro.princeton.edu, 2025 Nov 19

Why We Love Princeton

VALUES:

- Residential
- Quiet, clean & relatively* dark
- Healthy
- Community-driven
- Intellectual, knowledgeable, civilized
- Safe
- Nature-friendly

This talk focuses on the rapidly increasing light pollution of Princeton and the resulting degrading values

AST205 starparty, 2025 Fall, Graduate College

Starry Skies above Princeton

The night-time environment is relatively dark from a few remaining areas.

One measure of this is the visibility of celestial phenomena, including the stars.

AST205 starparty, 2022 Fall, Peyton Hall

Starry Skies above Princeton

Over hundred people gathered at the Institute for Advanced Study starparty in 2025.

IAS starparty, 2025 February

Starry Skies above Princeton

Comet AT2023, Graduate College

Hundreds of people saw the last few bright comets from Princeton.

Comet Neowise, Graduate College

Starry Skies above Princeton

Dark skies are important for Princetonians; students and residents.

Stargaze on the Forbes golf course

As a Rocky resident, the number of times I have walked past Forbes are few and far between, but the view of the golf course and distant yet stately grad tower is quite the sight. The open sky and vast expanse, partially detached from campus, make it a haven from academic worry and looming deadlines. The scenic green space lets the night fully revolve around the shining stars in the sky in contrast to the rest of campus, lit up by academic buildings and dorms. There would be nothing better than just me, my friends, and the moon.

See testimonials: https://starryprinceton.org/testimonials

Starry Skies above Princeton

Aurora Borealis, 2025 Nov 12

Starry Skies above Princeton

Aurora, 2025 Nov 12

Princeton from above

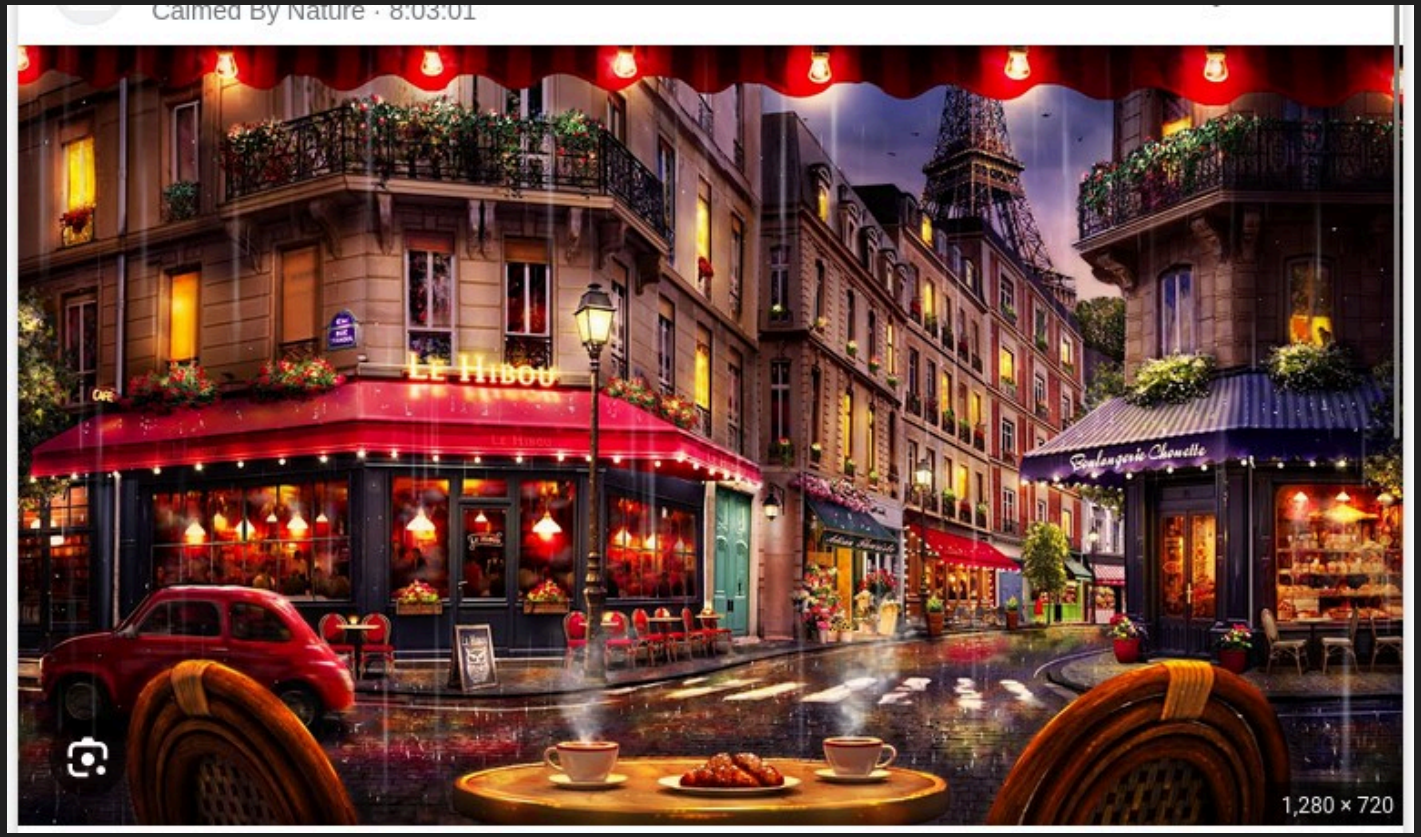
The reason for the bright sky and no stars:

Excessive, misdirected and blue lighting.

Photo: Princeton shopping center, image taken at late night.

Notice: lights are strong and “cold”, industrial “loading dock” ambiance.

Warm lights – welcoming ambiance



Dim and orange lights: good vibe
This is how we feel about Princeton.

Blue lights – “industrial” ambiance

Harsh and blue lights: “industrial park” atmosphere
This is what we don’t want in Princeton

Light Pollution

Definition:

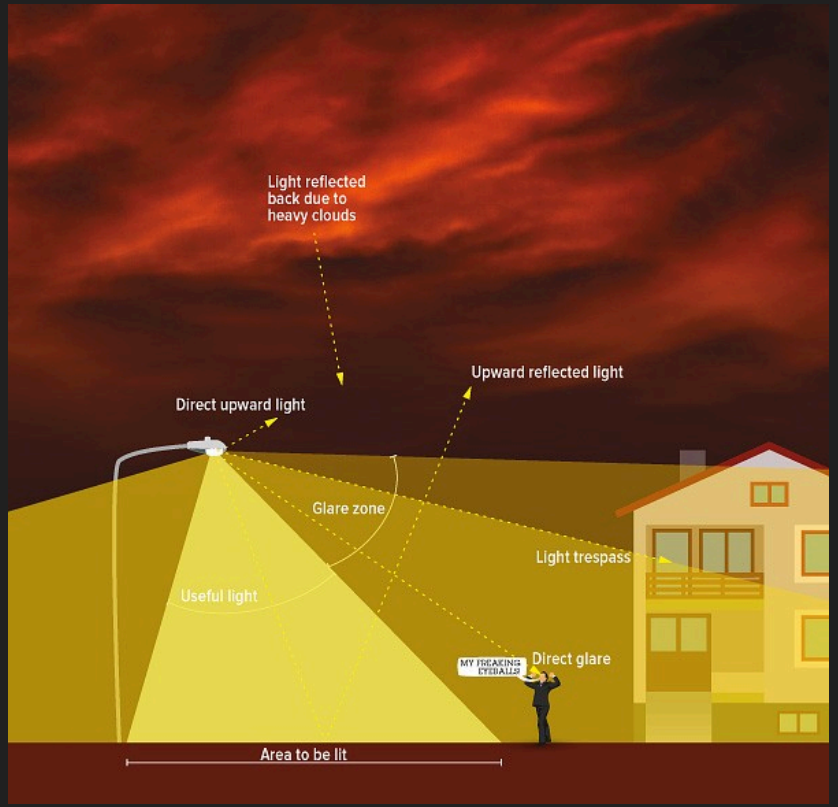
- Excessive,
- Misdirected or
- obtrusive artificial (usually outdoor) light

Sources:

- Public lighting (streets, parking lots)
- Residential lights
- “Industrial” lights.

Types:

- Ambient, from bright sky background
- Direct, “shining in your eyes”



Light Pollution in Princeton

Misdirected and excessive lighting:
Prospect Avenue at 1am

Well over 50% of the light is wasted.

Light Pollution in Princeton

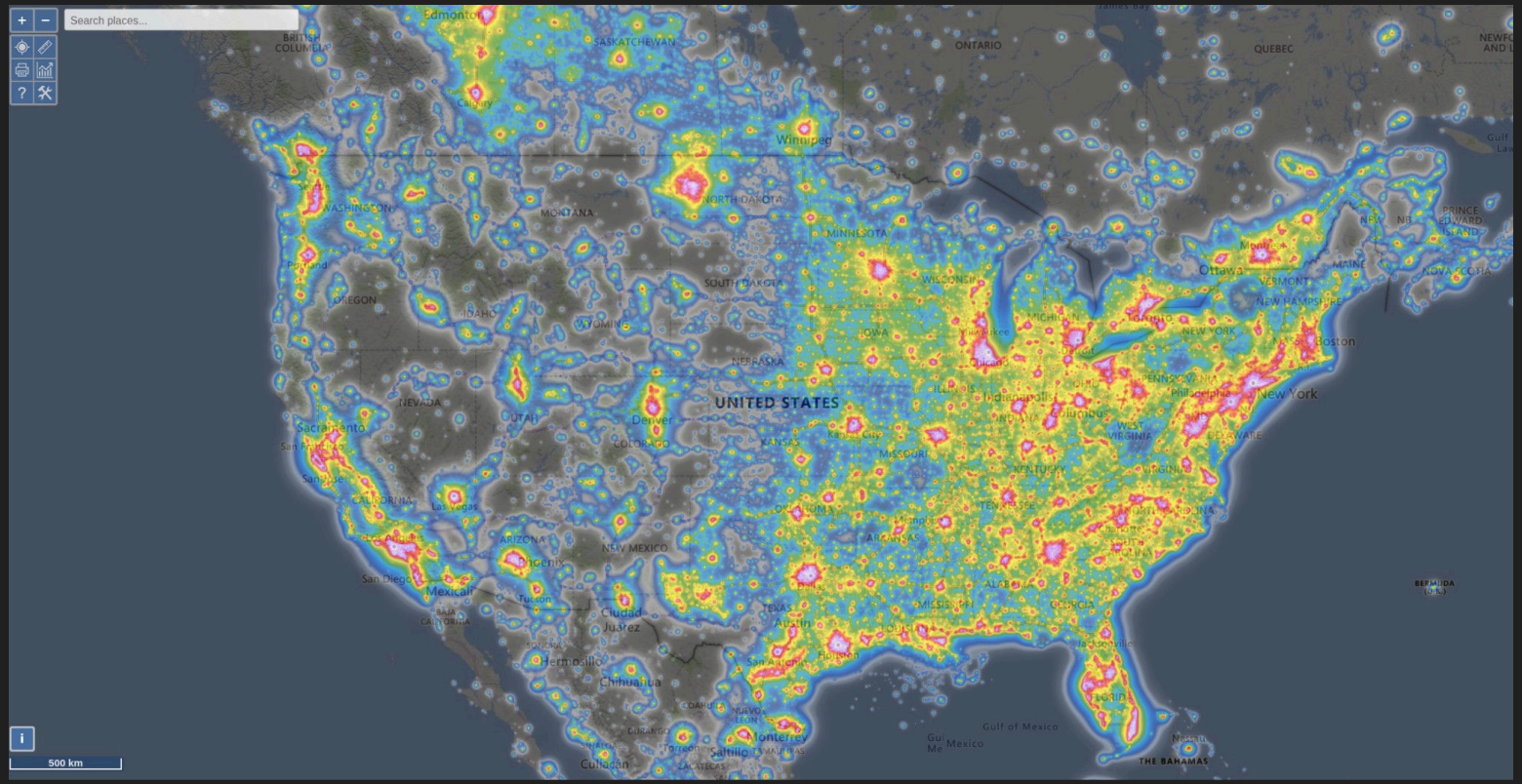
Obtrusive lighting:
Facing Riverside school, winter night at 2am

Light Pollution in Princeton

Obtrusive lighting.

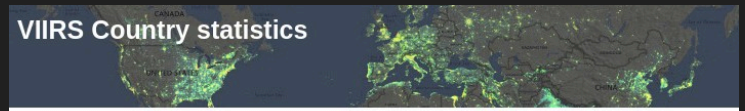
Riverside, winter night at 2am

Light Pollution in the USA



VIIRS satellite data, 2021.
Sky brightness from direct emission

Light Pollution – Global Statistics



○ ALL COUNTRIES ◉ OECD ○ EEA +UK +CH ○ G20

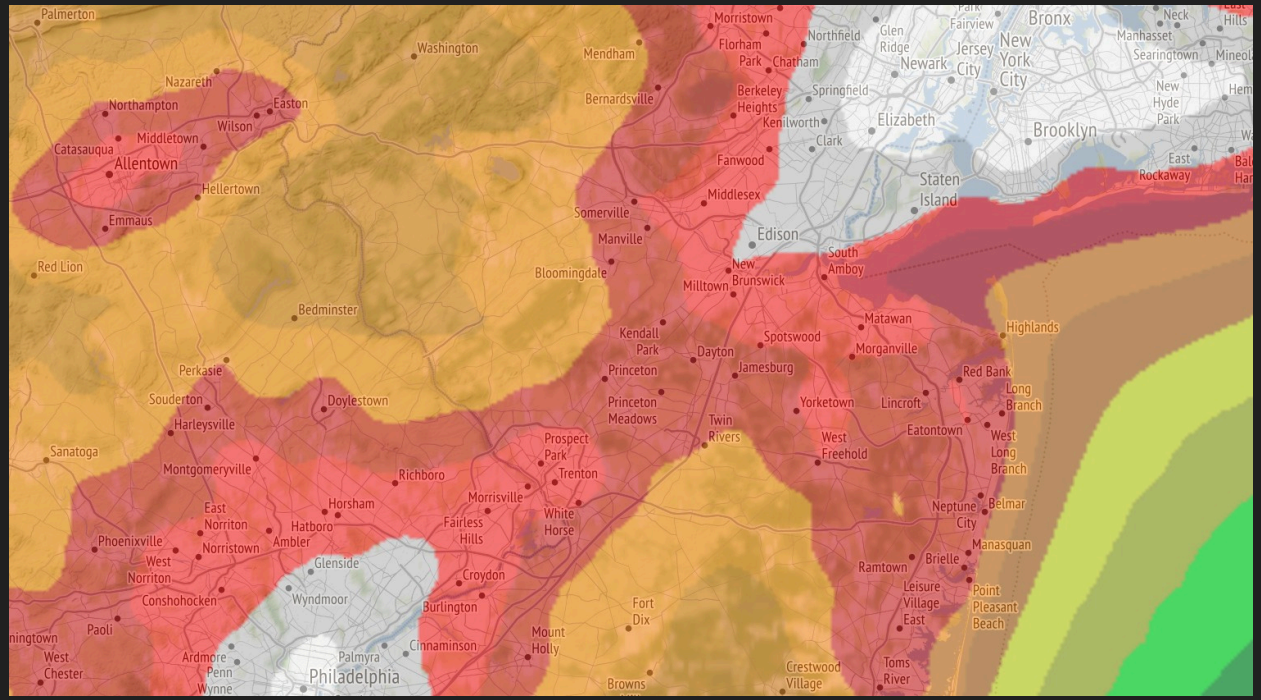
Country	Population	Area (sq. km)	Avg. Sum	Trend	Rad./1k pop	Avg. Mean
Germany	83,019,200	360,625.87	1,888,756	+0.02 %	22.8	1.127
Switzerland	8,555,541	41,244.59	216,338	-2.14 %	25.3	1.128
Denmark *	5,811,413	48,270.28	159,165	+1.66 %	27.4	0.709
Austria	8,869,537	83,859.51	255,643	+0.73 %	28.8	0.656
United Kingdom *	66,435,600	258,026.39	1,974,604	-3.44 %	29.7	1.646
Ireland	4,857,000	74,321.77	200,745	-1.84 %	41.3	0.581
Turkey	82,003,882	787,146.28	3,878,446	+5.98 %	47.3	1.060
France	67,009,000	554,494.12	3,453,697	-3.18 %	51.5	1.340
Netherlands	17,332,500	38,586.10	919,682	-1.99 %	53.1	5.128
Belgium	11,473,875	30,790.18	673,733	-0.44 %	58.7	4.709
Sweden *	10,272,518	459,853.46	673,095	+1.27 %	65.5	0.496
Canada *	37,553,100	10,133,038.69	2,611,881	-0.99 %	69.6	0.226
Luxembourg	613,894	2,581.40	44,012	+0.83 %	71.7	3.669
Greece	10,741,165	144,280.45	774,802	+0.84 %	72.1	1.155
Italy	60,359,546	307,441.81	4,554,193	-0.07 %	75.5	3.187
Spain	46,934,632	511,569.46	3,591,390	-1.36 %	76.5	1.510
Norway *	5,334,762	351,481.18	452,967	+0.41 %	84.9	0.495
United States *	329,572,000	9,555,291.61	32,147,660	-0.32 %	97.5	0.899
Portugal	10,276,617	93,928.59	1,039,112	-1.76 %	101.1	2.380

Light emission per capita per country – OECD

USA emits about 5x more light **per capita** as Germany, Switzerland, Denmark or Austria.

These are all highly developed countries with a high standard of living.

Light Pollution on the East Coast

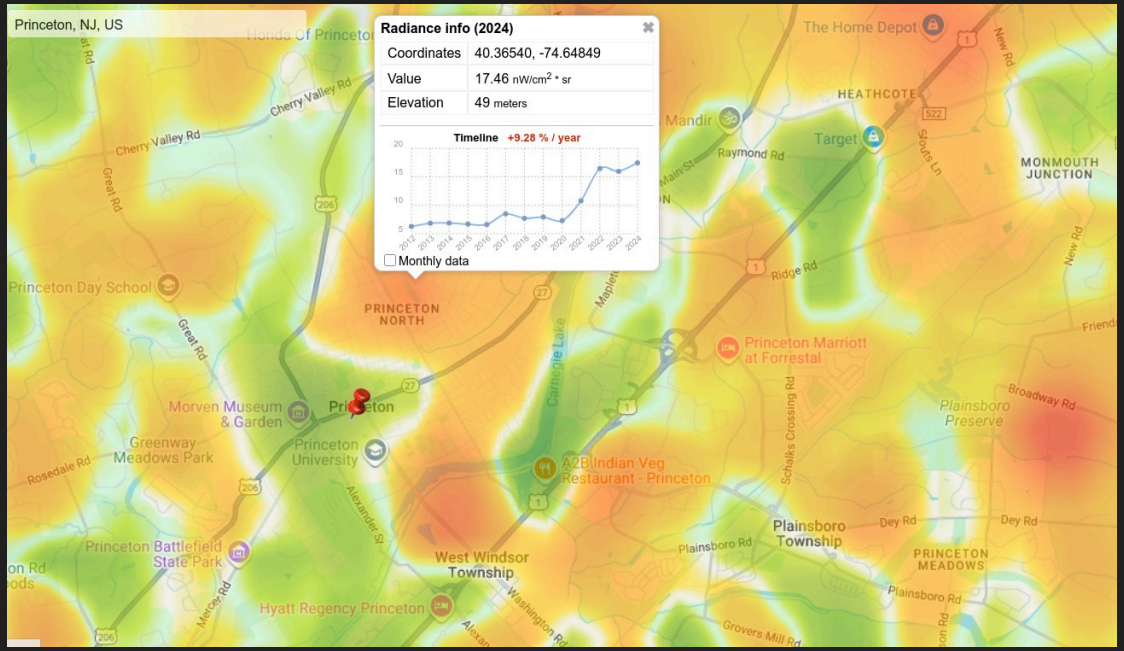


Darkskyfinder.com
Light pollution in the Princeton area.
Princeton is in the middle of a light corridor between Philly—Trenton--New Brunswick—NYC

There is an amazing and unique opportunity here: starry skies above Princeton!

Based on student polls, this is an important feature of Princeton.

Light Pollution in Princeton Increasing



Trend at Princeton over 10 years based on satellite data:

The pollution at least doubled.

The data are not fresh enough to reflect the recent Lake Campus and Stadium Drive Garage developments.

Based on my sky brightness measurements photometric measurements, the sky brightness increased by a factor of 2.5 since 2012.

This is dominantly from Princeton, and to some extent from West Windsor.

The trend can be easily reversed and even re-set to pre-LED levels.

Light Pollution Before Stadium Garage

BEFORE. Stadium drive construction.

Light Pollution after Stadium Garage

BLINK this slide with the previous one to see the difference.

Note the bright and blue colors.

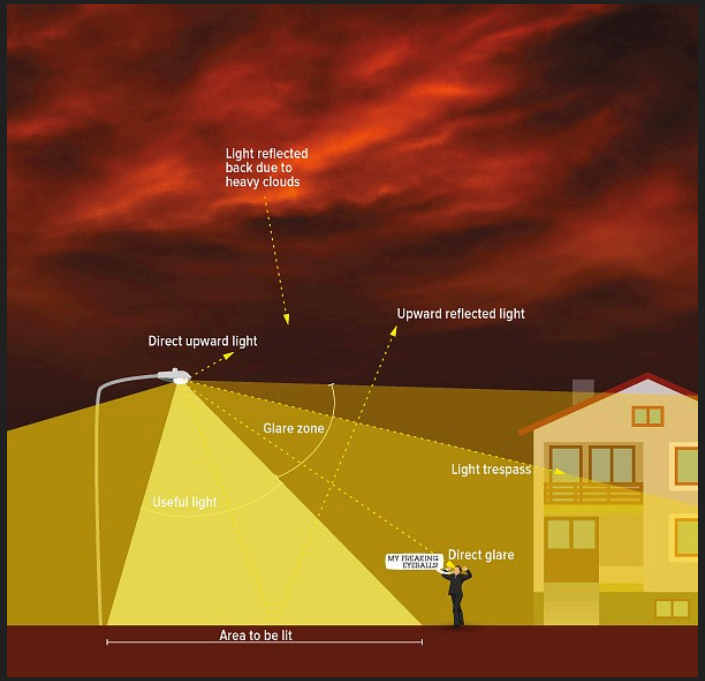
Faculty drive: sodium
Garage: 3000 K
Geothermal exchange: very blue, including area lights and bollards.

Princeton parking garage and Stadium, 2023 March 28, 10:30pm

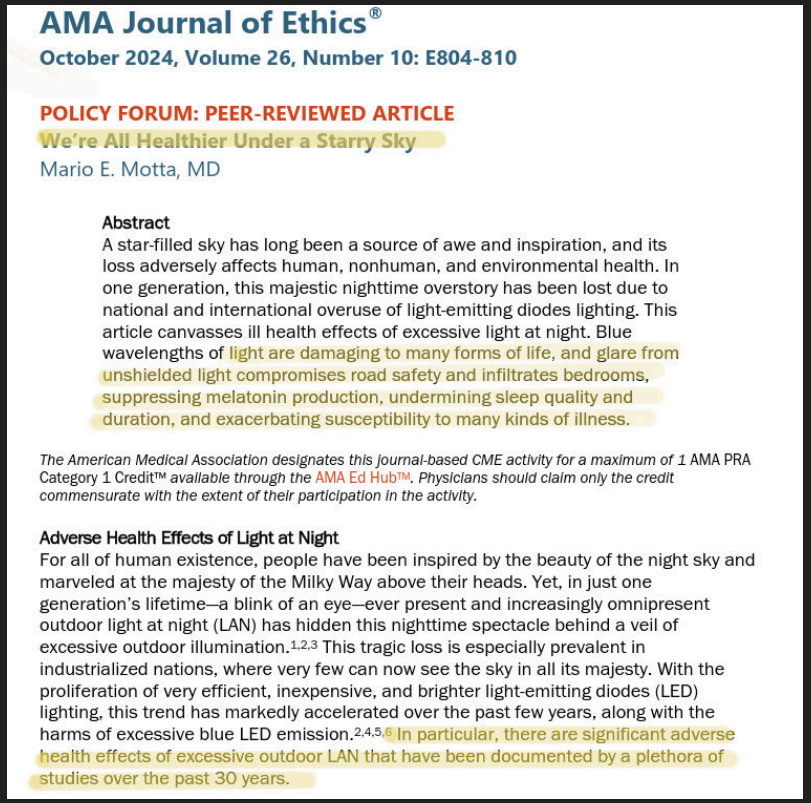
Visual comparison of these two slides confirms the satellite measurements of a steeply increasing pollution.

Effects of Light Pollution

1. Adverse health effects, disrupts the circadian rhythm of humans and wildlife
2. Safety (glare and overlighting are not safe)
3. Waste of energy
4. Disrupts ecosystems (insects, turtles, any nocturnal wildlife)
5. Losing the night sky, our important cultural heritage.
6. Harming education and research in astronomy



1. Effects of Light Pollution – Health



AMA Journal of Ethics®
October 2024, Volume 26, Number 10: E804-810

POLICY FORUM: PEER-REVIEWED ARTICLE

We're All Healthier Under a Starry Sky

Mario E. Motta, MD

Abstract

A star-filled sky has long been a source of awe and inspiration, and its loss adversely affects human, nonhuman, and environmental health. In one generation, this majestic nighttime overstory has been lost due to national and international overuse of light-emitting diodes lighting. This article canvasses ill health effects of excessive light at night. Blue wavelengths of light are damaging to many forms of life, and glare from unshielded light compromises road safety and infiltrates bedrooms, suppressing melatonin production, undermining sleep quality and duration, and exacerbating susceptibility to many kinds of illness.

The American Medical Association designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™ *available through the* AMA Ed Hub™. *Physicians should claim only the credit commensurate with the extent of their participation in the activity.*

Adverse Health Effects of Light at Night

For all of human existence, people have been inspired by the beauty of the night sky and marveled at the majesty of the Milky Way above their heads. Yet, in just one generation's lifetime—a blink of an eye—ever present and increasingly omnipresent outdoor light at night (LAN) has hidden this nighttime spectacle behind a veil of excessive outdoor illumination.[1,2,3] This tragic loss is especially prevalent in industrialized nations, where very few can now see the sky in all its majesty. With the proliferation of very efficient, inexpensive, and brighter light-emitting diodes (LED) lighting, this trend has markedly accelerated over the past few years, along with the harms of excessive blue LED emission.[2,4,5,6] In particular, there are significant adverse health effects of excessive outdoor LAN that have been documented by a plethora of studies over the past 30 years.

There is overwhelming evidence in the form of hundreds of refereed scientific publications and over 30 years of research that light pollution has strong adverse effects on our health.

Effects include: depression, diabetes, obesity, cancer

Please see recent compilation (Motta, Starry Sky):
https://journalofethics.ama-assn.org/podcast/author-interview-were-all-healthier-under-starry-sky

https://journalofethics.ama-assn.org/sites/joedb/files/2024-09/pfor1-peer-2410_0.pdf

1. Effects of Light Pollution – Health

The American Medical Association (AMA) led the way by alerting the world to the dangers of excess LAN back in 2012 with a report titled "Light Pollution: Adverse Health Effects of Nighttime Lighting" and a second report in 2016 titled "Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting."[11,12,13] Since then, 16 states and many cities and towns across the United States and in Europe have adopted the AMA recommendation to keep outdoor lighting below 3000 K.[14,15] Some companies, such as Apple, have even incorporated this recommendation in its products; the iPhone and iPad night shift setting limits blue light from screens after sunset.[16] However, implementation of the AMA recommendation to date has been sporadic in other companies and products.

https://journalofethics.ama-assn.org/article
messaging/2023-11

Cancer. There are now voluminous peer-reviewed articles showing a higher risk of hormonally linked cancers, such as breast and prostate cancers, with melatonin suppression.[4,21,22,23,24,25,26,27,28,29] Higher risk of thyroid and pancreatic carcinoma associated with LAN has also been reported in the literature.[30,31,32] The root problem lies in the disruption of circadian rhythmicity through suppression of melatonin production by the pineal gland. We evolved to have melatonin rise at sunset, but, in the modern world, melatonin production is delayed until bedtime and lights are out. Perniciously, however, even at bedtime, light penetrates into bedrooms in urban and suburban areas, further suppressing melatonin production. Melatonin has been shown to be an

disability glare.[5,19]

2. Light Pollution – Safety

The American Medical Association (AMA) led the way by alerting the world to the dangers of excess LAN back in 2012 with a report titled "Light Pollution: Adverse Health Effects of Nighttime Lighting" and a second report in 2016 titled "Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting."[11,12,13] Since then, 16 states and many cities and towns across the United States and in Europe have adopted the AMA recommendation to keep outdoor lighting below 3000 K.[14,15] Some companies, such as Apple, have even incorporated this recommendation in its products; the iPhone and iPad night shift setting limits blue light from screens after sunset.[16] However, implementation of the AMA recommendation to date has been sporadic in other companies and products.

https://journalofethics.ama-assn.org/article
messaging/2023-11

Glare. In addition to suppressing melatonin production, improperly designed and poorly shielded light fixtures can result in glare and create a road hazard condition. Indeed, "glare is the most common health safety problem resulting from poorly designed outdoor lighting,"[17] as intense blue LED lighting leads to discomfort and disability glare. As I have noted elsewhere:

> Over time, calcifications build up in the lenses of our eyes, which eventually develop into a cataract. These calcifications and other lens and eye imperfections scatter light in a similar fashion to a dirty windshield. This effect grows more severe with age, and is the primary reason why the elderly have a difficult time driving at night under poorly designed street lights.[17]

Recognizing that our streets could be safer places at night, the AMA adopted a policy in 2009 that urges full shielding for all public street lighting.[18]

Glare can be greatly mitigated by proper design, shielding, and installation so that no light shines above 80 degrees from the horizontal. The visual hazard posed by these very intense point sources is further magnified by cooler CCT LEDs, because blue light scatters more in the human eye than warmer wavelengths, leading to increased disability glare.[8,19]

Glare, overlighting and rapid changes in lighting levels are safety concerns

- Loss of contrast
- Glare hugely increases with age above ~50, with the calcification of lenses in our eyes
- Effect much enhanced with blue light (Rayleigh scattering)

- (See: https://www.ajo.com/article/S0002-9394(07)00520-X/abstract
  Van Den Berg TJTP, Van Rijn LJ, Michael R, et al.. Straylight effects with aging and lens extraction. Am J Ophthalmol.2007; 144: 358–363.e351

Light Pollution – Safety and Glare

This poor example for glare is on Ivy Lane, next to the EAS construction. The “temporary” lights have been up for a year.

They shine mostly upward and blind the pedestrians.

Light Pollution – Safety and Glare

This poor example for glare from a residential building. The lights are blue and blinding, causing a safety risk while driving. The driver is blinded right before a cross-walk.

Light Pollution – Safety and Overlighting

This poor example of overlighting.

One light on Terhune road was replaced with a super-bright LED source. The driver is blinded while passing through the bright patch and continues on a dark road.

Light Pollution – Safety and Overlighting

This poor example of overlighting.

One light on Terhune was replaced with a super-bright LED source.

Order of lights:
- cobra head with metal halide (blueish, decent brightness)
- cobra head with sodium (brighter)
- LED with ~5x the brightness.

3. Effects of Light Pollution – Energy

USA alone: $3 billion / yr directly in the sky.

(= 1/3rd of the annual budget of the NSF, or 1/10th of NASA's budget)

Based on a survey of existing light fixtures in Princeton, their light levels and their shielding, and the fact that they are on at all times during night (even when not needed), we estimate that the relevant electric bill of Princeton could be reduced by 75%.

3. Effects of Light Pollution – Energy

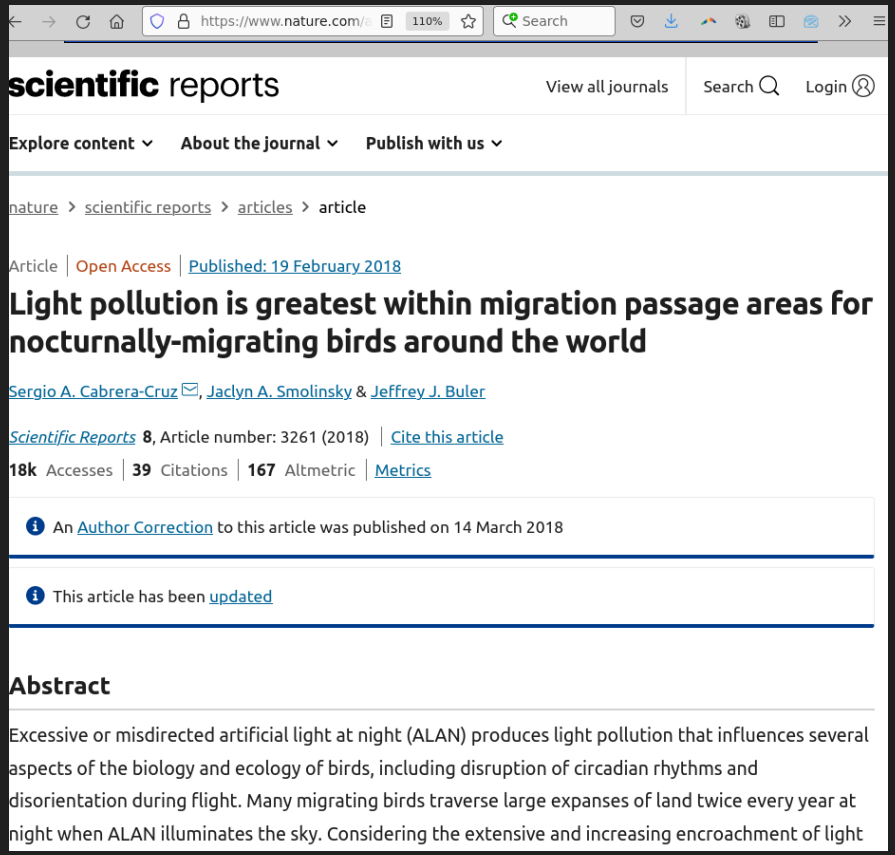
Solution

Cooper Lighting Solutions provided a Dark Sky certified solution that met all of Pepperell's desires, replacing all the town's 409 high-pressure sodium light fixtures with LED light fixtures from the Streetworks Archeon Series. These Archeon LED luminaires **reduce the town's total system wattage by over 80%;** with greater than **$80,000 in estimated maintenance savings and more than $800,000 in total savings estimated over a 10-year period.**[1] Also, because the LED light fixtures of the Streetworks Archeon Series can deliver a lower color temperature than other LED light fixtures, they reduce glare, skyglow and light trespass. This makes them perfect for the Town of Pepperell to achieve its Dark Sky-friendly goals.

(1) Assumptions: 10 hour daily run rate, 0.2223 KWH average rate

Pepperrell, MA introduced 2200K lighting, motion sensors, dimming after 11pm, and other measures, leading to $800,000 savings / 10 years.

4. Effects of Light Pollution – Ecosystems



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Article | Open Access | Published: 19 February 2018

Light pollution is greatest within migration passage areas for nocturnally-migrating birds around the world

Sergio A. Cabrera-Cruz, Jaclyn A. Smolinsky & Jeffrey J. Buler

Scientific Reports **8**, Article number: 3261 (2018) | Cite this article

18k Accesses | **39** Citations | **167** Altmetric | Metrics

An Author Correction to this article was published on 14 March 2018

This article has been updated

Abstract

Excessive or misdirected artificial light at night (ALAN) produces light pollution that influences several aspects of the biology and ecology of birds, including disruption of circadian rhythms and disorientation during flight. Many migrating birds traverse large expanses of land twice every year at night when ALAN illuminates the sky. Considering the extensive and increasing encroachment of light

Disruption of ecosystems spans a wide range, huge number of species affected (in)directly.

Examples:

- Insects
- Birds (see flap.org)
- Beavers (“the ghost of predators past”)

Insect apocalypse under way: population dropped to 45% due to light pollution.

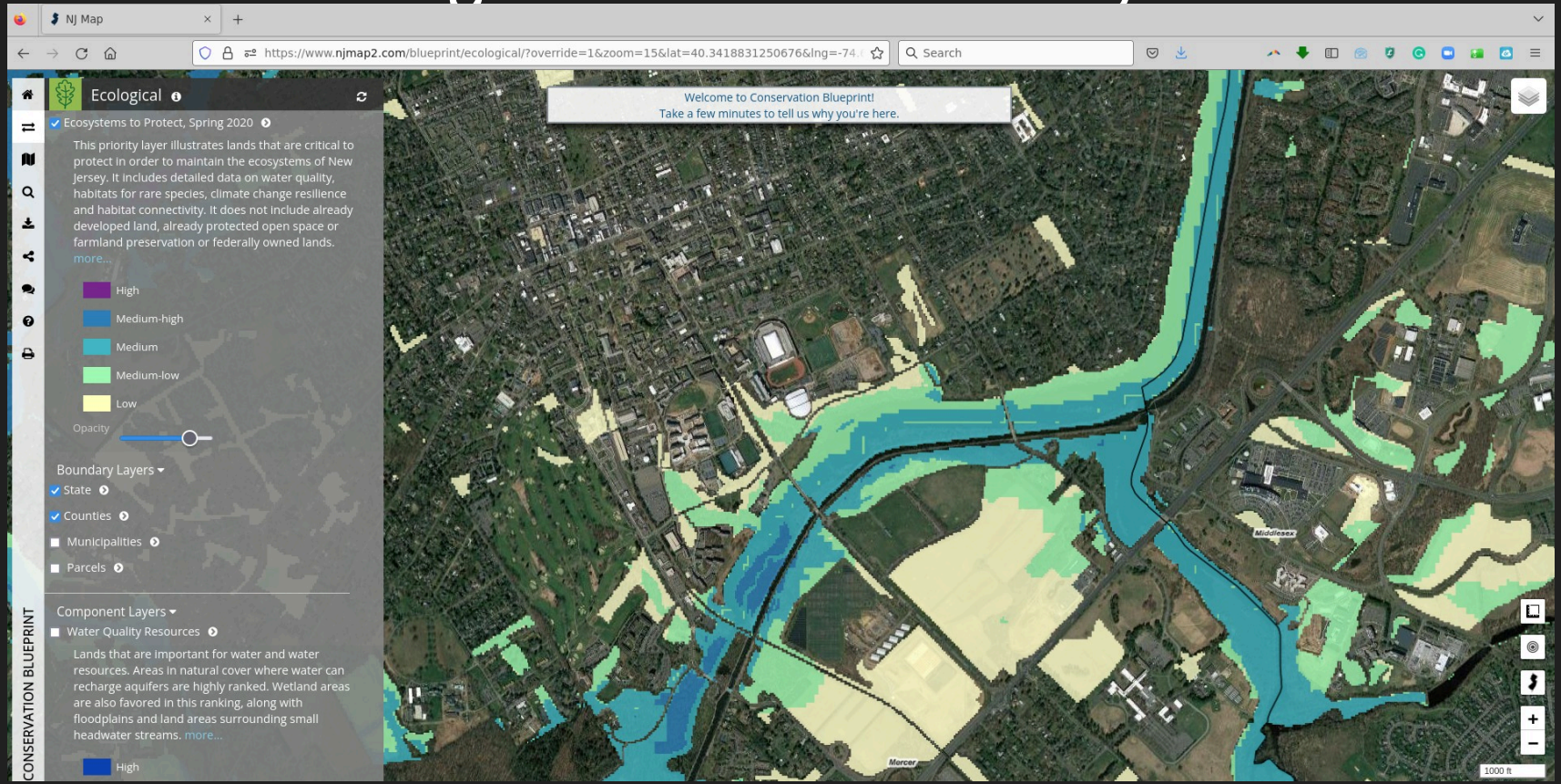
Princeton is surrounded by fragile ecosystems: D&R canal park, Stony Brook, Millstone, Lake Carnegie, Wildlife corridors.

Can scientists help insects survive their fatal attraction to light at night?

Scientists test differently colored lights on bridges and in parks to help stem the 'insect apocalypse'

Streetlights lure mayflies by the millions to their deaths, as seen on this bridge in Navarra, Spain. Researchers are testing ways to keep the insects closer to the water.

Effect of Light Pollution – Ecosystems



Princeton is surrounded by fragile ecosystems: D&R canal park, Stony Brook, Millstone, Lake Carnegie, Wildlife corridors.

Effect of Light Pollution – Ecosystems

Some of this fragile ecosystem was just recently lit up by unshielded “area” lights. The entire field across the lake is now constantly illuminated. ((Faculty road)

Starry Skies and Sensitive Ecosystems

Great Horned Owl

Starry Skies and Sensitive Ecosystems

Trees erased from the ecosystem by uplighting. No birds will nest on such trees.

Education, Research and Public Relations

Princeton's sky is valued by many other "layers" of our population: alumni, famous visitors, Nobel prize winners, musicians.

Photo: The Berlin Philharmonics and Maestro Dudamel on Peyton's Observing Rooftop Terrace

Light Pollution – Effect of Increased Sky Background

Visibility impacted both by direct lights blinding the observer, and indirect lights increasing the sky background.

An extreme example is the daytime sky, when due to the very high sky brightness, we only see one star ...

The following slides illustrate the
effect of sky background increase on the visibility of the night sky.

This slide shows an unpolluted dark sky with the Winter Milky Wa4y.
You can recognize the Big Dipper (slightly to the right) and Cassiopeia (in the Milky Way).

Simulations by G.Bakos, using stellarium

BLINK the next 9 slides.

Light Pollution – Effect of Increased Sky Background

The effect of sky background increase on the visibility of the night sky.

Increasing the sky background brightness...

Light Pollution – Effect of Increased Sky Background

Increasing sky background

The effect of sky background increase on the visibility of the night sky.

Light Pollution – Effect of Increased Sky Background

The effect of sky background increase on the visibility of the night sky.

Light Pollution – Effect of Increased Sky Background

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Light Pollution – Effect of Increased Sky Background

The effect of sky background increase on the visibility of the night sky.

This is about equivalent to the night sky above Princeton.

With a bright sky background we barely see anything, due to the lack of contrast.

Light Pollution – Effect of Increased Sky Background

The effect of sky background increase on the visibility of the night sky.

BLINK this slide with the previous one.

Light Pollution – What do we lose?

Lunar Eclipse and Northern Lights

With facades illuminated, the “heavenly” sights would be lost.

Most students did not see the Northern Lights from Princeton due to direct glare of street lights.

Light Pollution – What do we lose?

Parking garage across Lake Carnegie. Image taken in foggy conditions to indirectly measure the excess glow caused by the floodlighting of the building. These lights have been on for a year, and they are in stark contrast with the principles laid out in the Lighting Master Plan of 2015.

2025 Master Lighting Plan of Princeton University

03 LIGHTING GUIDELINES

Table 1: Recommended Pavement Illuminance Criteria for Roadway Lighting

ROADWAY CLASSIFICATION	AVERAGE TARGET HORIZONTAL ILLUMINANCE (FC)	MINIMUM TARGET VERTICAL ILLUMINANCE (FC) (4.9 FEET ABOVE GRADE)	UNIFORMITY (AVG TO MIN)
	LZ1 & LZ2	LZ1 & LZ2	(H)
ROADWAY (INTERMEDIATE / COLLECTOR)	0.4 – 0.8	-	3:1 – 4:1
ROADWAY (LOCAL / INTERIOR)	0.3 – 0.6	-	6:1
CROSSWALKS (INTERMEDIATE / COLLECTOR ROADS)	1.1 – 2.2	>= 1.1 – 2.2	4:1
CROSSWALKS (LOCAL / INTERIOR ROADS)	0.7 – 1.7	>= 0.7 – 1.7	6:1
CAMPUS ROADWAY	REFER TO PEDESTRIAN PATH - DISTANT FROM ROADWAYS RECOMMENDED ILLUMINATION VALUES. SAME VALUES APPLY TO CROSSWALKS TRAVERSING ALLEYWAYS.		

Recommended illumination levels adapted from Table 12-2 RP-8-22 Part 2 Lighting Roadway and Parking Facilities

Table 2: Recommended Pedestrian Pathway Illuminance Levels

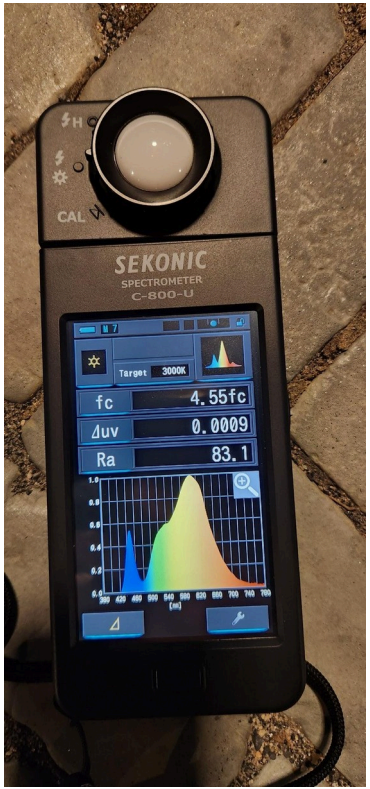
PEDESTRIAN WALKWAY CLASSIFICATION	AVERAGE TARGET HORIZONTAL ILLUMINANCE (FC)		AVERAGE TARGET VERTICAL ILLUMINANCE (FC) (6 FEET ABOVE GRADE)		UNIFORMITY (AVG TO MIN)
	LZ1	LZ2	LZ1	LZ2	(H)
PEDESTRIAN PATH - ADJACENT TO ROAD (INTERMEDIATE / COLLECTOR)	0.2 – 0.9	0.2 - 0.9	1	-	5:1
PEDESTRIAN PATH - ADJACENT TO ROAD (LOCAL / INTERIOR)	0.2 – 0.9	0.2 - 0.9	0.04	-	5:1 – 10:1
PEDESTRIAN PATH - DISTANT FROM ROAD	0.4 - 0.8 (landscape) 1 - 2 (bldgs.)	0.2 - 0.4 (landscape) 0.5 - 1 (bldgs.)	0.04	-	10:1
PEDESTRIAN PATH - STAIRS / ABRUPT CHANGE IN ELEVATION	2 - 3	1 - 2	1	-	5:1

Recommended illumination levels adapted from Table A-3 of RP-43-22 Lighting for Exterior Applications.

Recommended values of illuminance are: 0.2 - 0.9 FC

The master plan is under development

Measurements and photos taken Oct 2, 2025 at midnight



Illuminance on sidewalk on Ivy Lane (2025 Oct 2, midnight). This area, as currently implemented, is possibly the brightest lit area of the campus. Illuminance under the post is 4.55 FC. Recommended value in the 2025 master plan: 0.2–0.9 FC for LZ2.

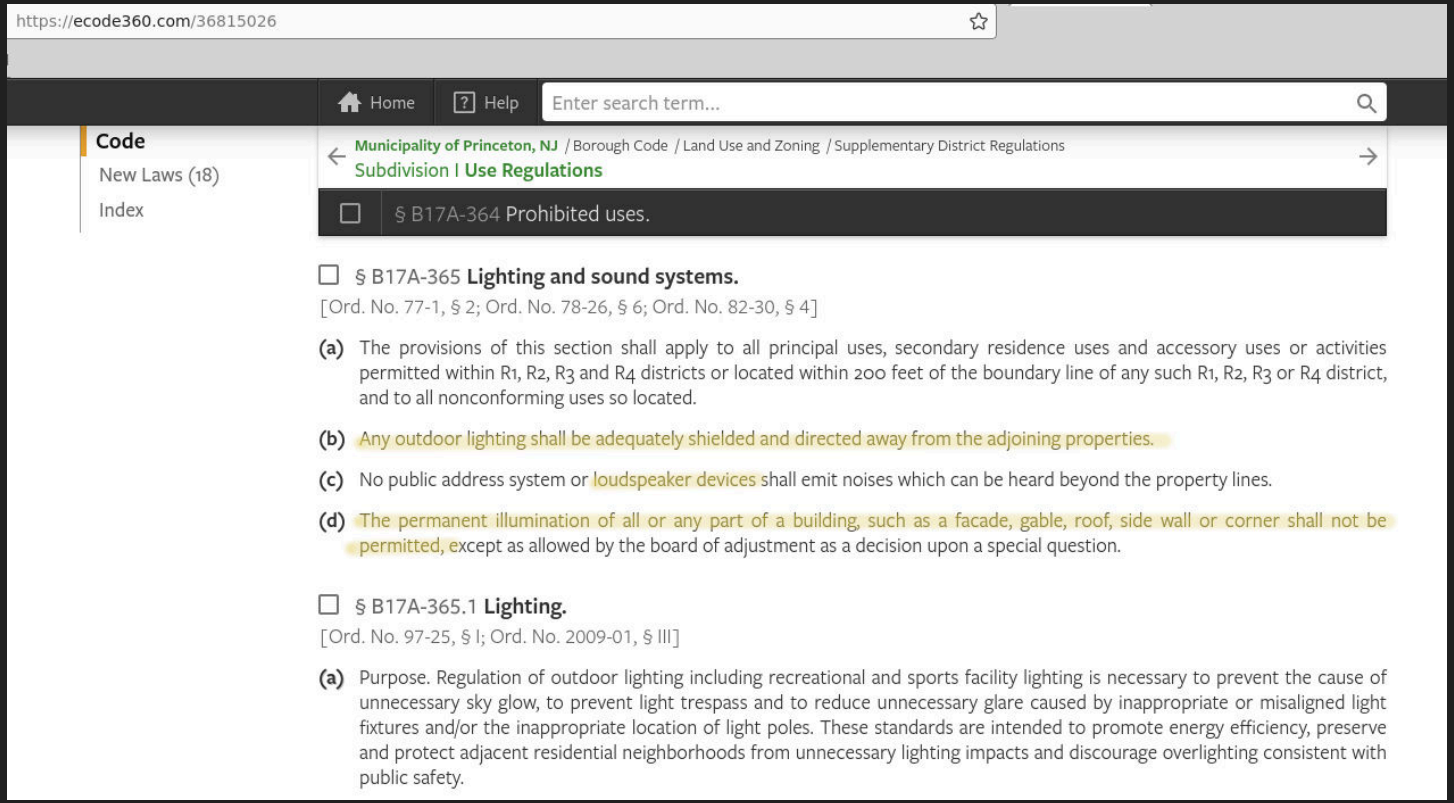
Overlit by factor of 4–20.

Implementation of master lighting plan and responsible lighting is lagging behind.

2025 Master Lighting Plan* – Introduction

Princeton University adopts the five principles for responsible outdoor lighting

Light Pollution



https://ecode360.com/36815026

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Code
New Laws (18)
Index

Municipality of Princeton, NJ / Borough Code / Land Use and Zoning / Supplementary District Regulations
Subdivision I Use Regulations

§ B17A-364 Prohibited uses.

§ B17A-365 **Lighting and sound systems.**

[Ord. No. 77-1, § 2; Ord. No. 78-26, § 6; Ord. No. 82-30, § 4]

(a) The provisions of this section shall apply to all principal uses, secondary residence uses and accessory uses or activities permitted within R1, R2, R3 and R4 districts or located within 200 feet of the boundary line of any such R1, R2, R3 or R4 district, and to all nonconforming uses so located.

(b) Any outdoor lighting shall be adequately shielded and directed away from the adjoining properties.

(c) No public address system or loudspeaker devices shall emit noises which can be heard beyond the property lines.

(d) The permanent illumination of all or any part of a building, such as a facade, gable, roof, side wall or corner shall not be permitted, except as allowed by the board of adjustment as a decision upon a special question.

§ B17A-365.1 **Lighting.**

[Ord. No. 97-25, § I; Ord. No. 2009-01, § III]

(a) Purpose. Regulation of outdoor lighting including recreational and sports facility lighting is necessary to prevent the cause of unnecessary sky glow, to prevent light trespass and to reduce unnecessary glare caused by inappropriate or misaligned light fixtures and/or the inappropriate location of light poles. These standards are intended to promote energy efficiency, preserve and protect adjacent residential neighborhoods from unnecessary lighting impacts and discourage overlighting consistent with public safety.

Princeton Municipality Code for Lighting
Regular review? Enforcement?

Light Pollution

Available outdoor lighting fixtures (Home Depot)

Light Pollution

Dark sky friendly fixtures

An example of a dark-sky compliant fixture

General Recommendations for “Starry Princeton”

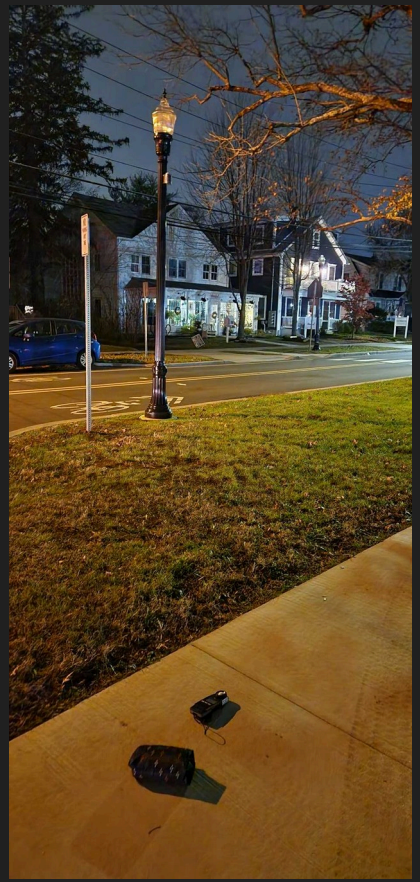
- Adopt the responsible lighting principles of International DarkSky.
- Use **fully shielded fixtures**. Fully shielded means 100% of light goes 10deg below horizon. BUG rating of 0-0-0.
- Use warm color temperature lights, amber LEDs, **2200K or even less around dark sky areas**.
  Note: high pressure sodium is approx ~2200K.
  Also note, all these LED spectra are non-planck curves; color temperature association is very loose.
- Do not overlight.
- Use modern technology: dimming and motion sensors.

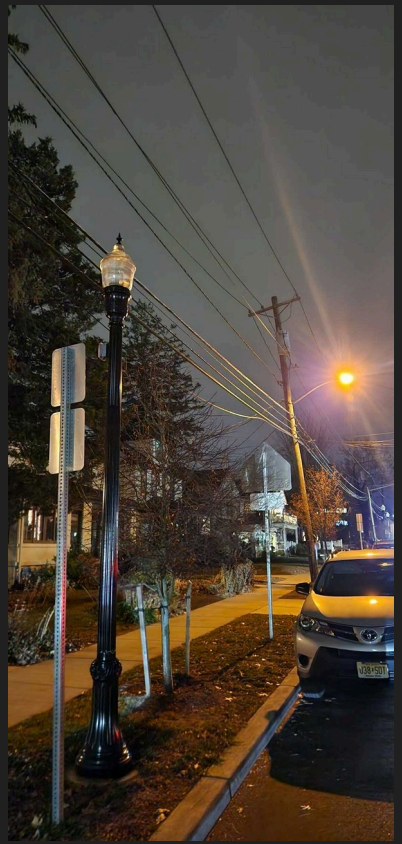
- Establish task force/committee on light pollution in Princeton.
- Replace and phase out light polluting fixtures at high priority.
- Review all new constructions, apply strong standards on accepted lighting before installation
- Educate population on light pollution and proper practices.
- Establish dark sky “starview” areas with zero stray light.
- Monitor direct light pollution (glare, uplight) and sky background.

Short-term action items

- All new LED streetlights should be installed with dimming to ~30% of default.
- All new LED streetlight replacements should come with <= 2700K setting, preferably 2200K
- Current and near-future lighting plans reviewed before implementation
- Survey of streets for glare/light trespass, education, request for changing/shielding fixtures.

Short-term action items





New Witherspoon fixtures? Are they going to be turned on?
They are strongly light polluting fixtures installed at very high density, in an area with already adequate lighting on the sidewalk (0.22 FC)

These ~hundreds of fixtures will have a devastating effect on the skyglow, and will also make Witherspoon less “habitable” with excessive obtrusive light falling on the residential buildings.

Medium-term

- Review and revise our code.
- Review the implementation of the code.
- Study Pepperrel's (or Hopewell's) example, adopt their code and solutions.
  https://town.pepperell.ma.us/DocumentCenter/View/5658/Appendix-A-Outdoor-Lighting-ByLaw
- Fund research on light pollution, including development, aerial monitoring, task force.
- Educate Princetonians on the issue

Allowed fixtures in Pepperrel vs Princeton

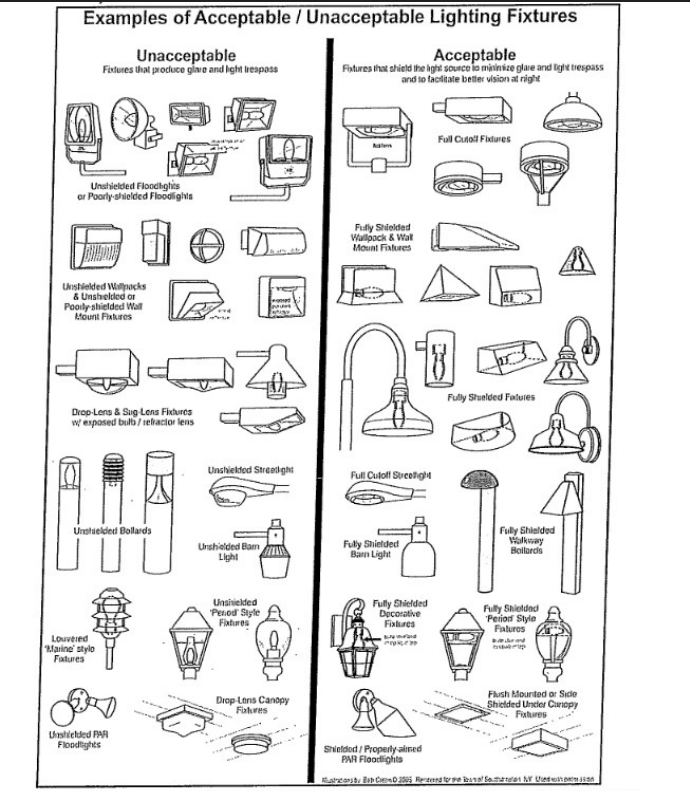


Figure 2: Examples of acceptable and unacceptable lighting fixtures / luminaires. The intent of this figure is to demonstrate that "acceptable" lighting eliminates or reduces glare by hiding the light emitting portion of the bulb or lamp, not that the general style of fixture is prohibited.

Long-term

- Establish dark sky parks, e.g. Broadmead or the Butler (former) graduate housing area.
- Establish a small community observatory in town.
- Lead the way in becoming a fully dark sky compliant town.

References

- International Dark Sky Association: https://www.darksky.org/
- Contact me if you have a “bright” idea: gbakos@astro.princeton.edu
- Links: https://www.astro.princeton.edu/~gbakos/lp/
- Video on youtube (please glance at it and share): https://www.youtube.com/watch?v=FW0WZX75Nmo (Dark Sacred Night).
- Student feedback: https://starryprinceton.org/testimonials
- Pepperrel, MA, lighting solution: https://www.cooperlighting.com/global/resources/case-studies/streetworks-preserves-pepperell-night-sky-case-study
- Www.starryprinceton.org
- International darksky: www.ida.org