

Planning to Mitigate Light Pollution



Outdoor lighting at the Rantoul post office

Champaign County Regional Planning Commission (CCRPC)

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CHAMPAIGN COUNTY
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1.0 Introduction

The rural member agencies of the Champaign County Regional Planning Commission (CCRPC) requested staff to research information about efforts to develop planning methods that aim to mitigate light pollution in the area. The purpose of this document is to provide a foundation for Champaign County communities to address light pollution at the municipal and regional levels. This is especially important because there is potential for light pollution to worsen due to increasing population in Champaign County and increasing student enrollment on the University of Illinois campus, and therefore increased development demand such as recent residential and commercial developments on the periphery of the Champaign-Urbana urbanized area. Growth and development are not inherently bad, but they should happen in a responsible manner that do not harm living creatures and the environment.

Information and funding sources on this topic are always evolving, and all information in this document is up to date as of June 2023. Readers can use the links provided in this document to find the most updated information beyond the publication of this document.

1.1 Light Pollution & Its Effects

Light pollution is the unwanted effect of artificial lighting on the sky and other surrounding natural features, especially during evening and night hours. Light pollution is man-made and is an effect of increased urbanization and suburbanization. In addition to compromising the quality of the environment, the DarkSky (formerly the International Dark-Sky Association) estimates that over \$1 billion in energy costs is spent each year in the United States to generate this wasted light.

Each night almost a third of the light used out-of-doors escapes into the night sky where it causes light pollution instead of its intended purpose of useful illumination. About 2,500 individual stars should be visible to the human eye in an unpolluted night sky; but in a typical suburb only 200 to 300 stars are visible, and in a city fewer than a dozen stars may shine though the artificially lit sky.

Additional harmful effects of light pollution include causing a hazardous glare that can reduce safety, excessive energy consumption, waste of money and resources, disruption of ecosystems' natural day and night cycles, suppression of melatonin production, and several negative repercussions on public health.

1.2 Mitigation Measures

Solutions to mitigate light pollution usually come in the form of street light redesign, use of different lightbulbs, and fixing light fixtures. These solutions can be implemented through zoning codes, building codes, citywide ordinances, and coordination with owners of public infrastructure (such as roads and schools). The image below shows a general spectrum of light fixtures and their effect on light pollution.

1.3 Definitions

Artificial Light – light, ranging in wavelength from the ultraviolet to the near-infrared, that is caused, directed, or used by humans for any purpose

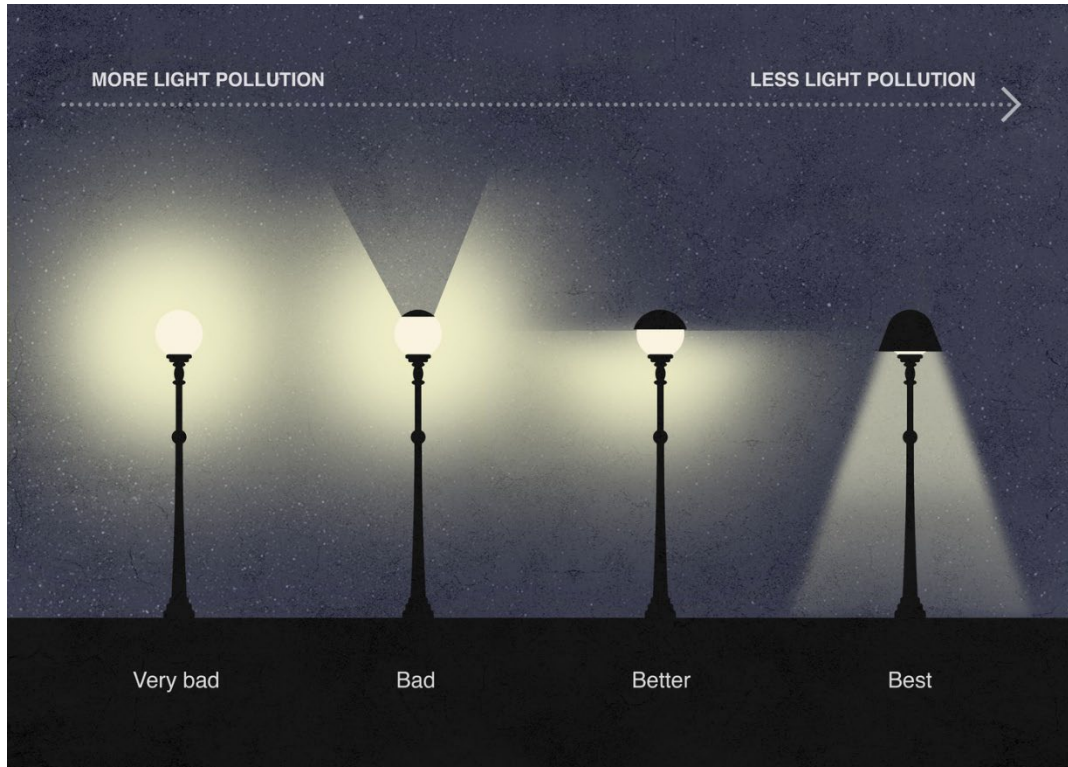
Glare – excessive and uncomfortable levels of brightness that may lead to impaired visibility

Light Pollution – the unwanted effect of artificial lighting on the sky and other surrounding natural features, especially during evening and night hours

Light Trespass – when light enters an unwanted area, such as through someone’s window

Luminaire – an individual lighting assembly, including the lamp and any housings, reflectors, globes, lenses, shields, or other components designed to block or distribute light

Skyglow – an effect of light pollution that diminishes the luminance of the night sky



Light fixtures that contribute to or reduce light pollution (Source: Valeria Montjoy, ArchDaily)

1.4 Sources

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- U.S. Census Bureau; Census 2020, Table P1; generated by CCRPC staff; using data.census.gov; <https://data.census.gov/>; (18 August 2021).
- Village Code of Homer Glen, Illinois. (2015). *Part 20 Outdoor Lighting, Section 75-63 Definitions*. <https://ecode360.com/30670062>.

2.0 Existing Efforts

There are several ongoing efforts within Champaign County to address and mitigate the issue of light pollution. These current solutions are mainly in the form of recreational awareness and a focus towards promoting improved views of astronomical phenomenon.

2.1 Champaign County Dark Sky Week

The [Champaign County Dark Sky Week](#) is a local awareness and promotional campaign run by the Champaign County Forest Preserve District (CCFPD) and the Champaign County Audubon Society. It aims to spread awareness around the issue of light pollution and the promotion of dark sky initiatives in order to address how these “factors impact humans and wildlife.” Events often align with International Dark Sky Week. This local campaign is relatively new, having been launched in 2020, but faced challenges as a result of the COVID-19 pandemic. The most recent event that was held was during the week of April 5-11, 2021, much of it in a virtual format. It featured webinars on topics such as dark sky resources, bats in Illinois, preventing bird window strikes on the University of Illinois campus, and other light pollution themes.

The campaign runs a website that hosts light pollution mitigation resources for local residents, details upcoming events, and encourages people to sign a “Lights Out!” pledge.

2.2 Middle Fork Forest Preserve (Illinois’ Only Dark Sky Park)

[Middle Fork Forest Preserve](#) is a 1,704-acre park located in northeast Champaign County near Penfield, and is owned and operated by the Champaign County Forest Preserve District (CCFPD). In November 2018, the forest preserve was designated as the [first \(and so far, only\) International Dark Sky Park in the entire state of Illinois](#). Efforts to achieve the designation were led by CCFPD and the Champaign-Urbana Astronomical Society (CUAS). This is a result of earlier efforts by the CUAS to lobby for changes to street light design within the City of Champaign and to offer “Starwatch” astronomy-related stargazing programs through CCFPD’s Education Department.

CCFPD spent over \$20,000 in 2016-17 to upgrade its outdoor lighting to comply with DarkSky (formerly International Dark-Sky Association) recommendations and to develop new interpretive programs to provide awareness of the benefits of nighttime darkness. Funding partners included the Illinois Clean Energy Community Foundation and the Community Foundation of East Central Illinois (CFECI), along with other private donors.



A starry-eyed observer points to the night sky at Middle Fork Forest Preserve (Source: DarkSky)

2.3 Illinois State Light Pollution Resolution

In March 2010, the Illinois General Assembly adopted a [resolution \(HR0884\)](#) that expresses state support for improved nighttime preservation practices and encourages local government and agencies, such as the Illinois Sustainable Technology Center, to research and adopt suitable outdoor lighting practices.

2.4 University of Illinois Library Resources

The [University of Illinois Main Library](#) has published a page that lists various guides and resources that address light pollution and sensible light alternatives.

- The [Calgary By-Law Project, Light Pollution Abatement](#) discusses the factors that government in Calgary, Alberta, Canada should consider when regulating light pollution. This includes reasons why Calgary needs such a law and specific recommendations to include.
- The [Institute for Local Self-Reliance light pollution webpage](#) links to three model city ordinances governing light pollution. These city ordinances are from Sanibel Island, Florida; Springfield, Vermont; and Tuscon/Pima County, Arizona.
- The Municipal Research and Services Center (MSRC) of Washington webpage on [Light Nuisances](#) lists information on light pollution and nuisances for local governments in Washington State.
- DarkSky has a webpage on [Model Lighting Laws & Policy](#). Lighting ordinances are an important tool for setting reasonable limits on light pollution. DarkSky encourages cities to adopt and enforce ordinances that call for shielded, downward-pointed lighting, curfews, and other sensible controls. Doing so conserves energy and helps to minimize glare, light trespass, and skyglow.
- DarkSky and the Illuminating Engineering Society of North America (IES) have developed a [Model Lighting Ordinance \(MLO\)](#) to address the need for strong, consistent outdoor lighting regulation in North America.

- The State of New Mexico developed the [New Mexico Night Sky Protection Act](#). The purpose of this Act is to regulate outdoor night lighting fixtures to preserve and enhance the state’s dark sky while promoting safety, conserving energy, and preserving the environment for astronomy.
- The [Village of Homer Glen, Illinois](#) passed an ordinance regulating outdoor lighting in December 2007 (see Section 4.1 for more information).
- The [2010 Pattern Outdoor Lighting Code \(USA\)](#) document is based on the USA Pattern Code contained within the *Outdoor Lighting Code Handbook*, published by DarkSky in 2000. It is the intent of this Code to define practical and effective measures by which the obstructive aspects of outdoor light usage can be reduced, while preserving safety, security, and the nighttime use and enjoyment of property. These measures are intended to curtail the degradation of the nighttime visual environment, reduce light trespass, glare, energy, and resource waste by encouraging lighting practices that direct appropriate amounts of light where and when it is needed, increasing the use of energy-efficient sources, and decreasing the use of poorly shielded or inappropriately directed lighting fixtures.

2.5 Urbana Pedestrian Master Plan

The [2020 City of Urbana Pedestrian Master Plan](#) recognizes that street lighting can be an important part of pedestrian infrastructure. In some areas, additional or upgraded lighting may improve safety and security in the dark. In other areas, lighting may be unnecessary or even bothersome, creating light pollution.

The plan includes an existing street light density map, and notes neighborhoods with few street lights (including several on the periphery of the city), but no specific street light installation recommendations are made. A resource on [lighting use and design](#) from the Project for Public Spaces is included when future street light installation is considered.



An intersection street light in East Urbana

2.6 Walk Champaign Pedestrian Plan

The City of Champaign’s 2014 [Walk Champaign Pedestrian Plan](#) acknowledges that lighting forms an essential part of the safe walking experience, and recommends intersections where street lights should be installed using funding from the Neighborhood Street Light Program. However, the plan also notes that each potential lighting project should carefully balance the wishes of dark-seeing neighbors against the needs of pedestrians and drivers to be able to see each other at night.

2.7 Sources

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3.0 Model Lighting Ordinances

Model lighting ordinances are a popular method for local municipalities to mitigate light pollution and commit to safe outdoor lighting as most street lights are under public or utility company ownership and maintenance. DarkSky (formerly the International Dark-Sky Association) endorses them as a way to achieve light pollution mitigation while saving taxpayer dollars for local governments and increasing overall public safety. DarkSky partnered with the Illuminating Engineering Society of North America (IES) in 2011 to develop and publish a [Model Lighting Ordinance \(MLO\)](#) template that aims to help local governments create outdoor lighting standards that “reduce glare, light trespass, and skyglow.”

3.1 Village of Homer Glen, IL

The [Village of Homer Glen](#) is located in the Chicago metropolitan area and is home to 24,543 residents, according to the U.S. Census Bureau’s 2020 Census. In December 2007, the Homer Glen Village Board passed an [ordinance](#) that was aimed at regulating outdoor lighting. The Village and this ordinance were honored in March 2008 by then-Illinois Lt. Governor Pat Quinn. The ordinance is part of the Village building code, and addresses topics such as applicability, lighting zones, illumination and luminaire standards, enforcement, and administrative variances.

The Village includes the following resources on its Outdoor Lighting website, many of which come from the Illinois Coalition for Responsible Outdoor Lighting:

- [Flagstaff, Arizona Dark Skies Coalition](#)
- [Illinois Coalition for Responsible Outdoor Lighting](#)
 - [Light Fixture Theory 101](#)
 - [Bright as the Full Moon: How Much to Light Up the Night \(PDF\)](#)
 - [Digital Billboards: New Regulations for New Technology \(PDF\)](#)
 - [Fireflies and Lightbulbs: Does Manmade Light Impact Ecosystems \(PDF\)](#)
 - [Outdoor Lighting and Crime Prevention \(PDF\)](#)
 - [Outdoor Lighting Ordinances: Proven Alternatives to the M.L.O. \(PDF\)](#)
 - [Phantom Load Vs. Monstrous Waste \(PDF\)](#)
 - [The Challenges of Finding Good Outdoor Lighting Fixtures \(PDF\)](#)
 - [The Color of Lights – More Than Meets the Eye \(PDF\)](#)
- [U.S. News and World Report Article: Turning Out the Lights](#)

3.2 Sources

- DarkSky. (2023). *Model Lighting Laws & Policy*. <https://www.darksky.org/our-work/lighting/public-policy/model-lighting-laws-policy/>.
- U.S. Census Bureau; Census 2020, Table P1; generated by CCRPC staff; using data.census.gov; <https://data.census.gov/>; (5 June 2023).
- Village of Homer Glen, Illinois. (2007). *Outdoor Lighting*. <http://www.homerglenil.org/2237/Outdoor-Lighting-Light-Pollution>.

4.0 Street Light Design

New designs in street lighting on public infrastructure serves as a key component to mitigating light pollution as most street lights are under public or utility company control and maintenance.

There are several different types of street light designs:

108 Street Lamp/Urbidermis Santa & Cole

Made of a continuous tubular structure, the luminaire is a simple, yet functional street lamp that – using multi-chip LED modules – directs a soft, diffused, and angled light into the surface.



Albertslund Post Maxi/Louis Poulsen

This fixture emits a symmetrical, downward directed light that is glare-free. While a top shared made from formed fiberglass prevents light from being emitted upwards, white paint reflectors create a diffused and comfortable light distribution.



Gradonna Mountain Resort, Kals/ewo

Equipped with LED technology in a warm, inviting color, the design guarantees a precisely measured level of illumination for the area. In this way, energy consumption is minimized, and light pollution is avoided.



Living Room LED outdoor light/BURRI

Looking to achieve a cozy living-room ambience, the energy-efficient LED lamp gives out a warm light in a precise tilted orientation that prevents pollution upwards or towards facades.



Vector Pole Black/Dexter

Combining extreme simplicity with a beautiful and unique character, this refined design provides a directed light that is energy-efficient, functional, and sustainable.



Tumbler pole accessories/Urbidermis Santa & Cole

Characterized by an elegant minimalistic style, the design acts as a domestic lamp shade for urban uses. With a shielded light that points downwards, it minimized night sky glow.



Wide/Escofet 1886

This high-tech, contemporary light is enveloped by a casing that also allows the installation of other modules. It is adaptable to different LED optical systems and can achieve different energy-efficient powers by simply changing the length of the lamp (in accordance to the necessary modules).



Homann Park/Louis Poulsen

This fixture is self-illuminating and provides direct downward illumination that emphasizes the shape of the luminaire, creating ambiance and comfort.



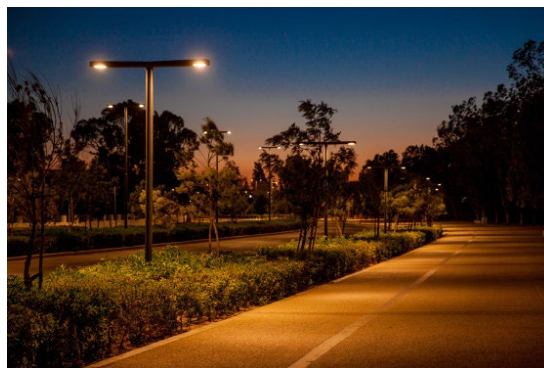
Twilight Bilbao/iGuzzini

Inspired by achieving the right balance between aesthetics, functionality, and respect for the environment, the urban lighting system is a circular and extremely compact structure that is ideal in preventing glare.



Rama pole application/Urbidermis Santa & Cole

With a minimalist lighting system and prominent linear features, the fixture helps lend urban spaces a sense of orderliness and harmony. With warm LED tones, it offers a variety of light distributions, assuring visual comfort and luminous efficacy without pollution.



Nova Pole/Blond Belysning

Using a spun bowl and a gradient glass, the glare-free design directs the majority of the LED light downwards while also distributing it inside the shield.



There are various other types of street light designs that local municipalities can examine in order to ensure they meet their needs, fit appropriately with the character of neighborhoods, and are within funding capabilities.

4.1 Sources

- Montjoy, Valeria. (24 February 2022). *How to Reduce Light Pollution With Street Light Design?* ArchDaily. <https://www.archdaily.com/977131/how-to-reduce-light-pollution-with-street-light-design>.