

Reducing Light Pollution to Protect Public Health, Safety

By Kenneth J. Warren

Many Philadelphians consider the artificial light illuminating our environment at night and blinding our vision of the night sky to be an inevitable result of our modern society and economy. Thousands of streetlights illuminate our roadways and surrounding areas. Office buildings, manufacturing facilities, retail stores, warehouses, billboards, and even residential properties often leave bright lights on at night. In Philadelphia and other urban locations, few stars are visible. We tolerate this dramatic departure from the natural world and have not taken sufficient action to rectify it.

But the harmful effects of light pollution, which extend far beyond impaired star gazing, are similar to injuries caused by pollutants that are regulated under federal, state or local environmental laws. Studies have shown that bright lights at night can interrupt sleep, alter circadian rhythm and suppress melatonin production. Artificial night light also increases the risks of depression, insomnia, obesity, diabetes, heart disease and cancer. The severe adverse impacts to human health from lighting our surroundings at night pose a serious public health challenge.

Bright lights likewise affect the health of wildlife and the functioning of ecosystems by altering animal behaviors. Diminished reproduction of frogs and other amphibians due to disruption of nocturnal activity, confusion of hatchling sea turtles seeking the ocean, disorientation of birds navigating by the stars, resulting in collisions with illuminated buildings, and fatalities to insects are among the adverse effects of brightening the night sky. The [Artificial Light at Night \(ALAN\) database](#), contains citations and links to peer reviewed literature detailing these and other harms to wildlife and ecosystem functions from artificial light at night.

No valid reason exists for continuing to inflict these harms. Proponents of installing bright night lighting assert that it will deter criminal activity. Researchers have shown, however, that the glare from bright lights diminishes visibility, thereby obscuring the presence of intruders. Glare also reduces the effectiveness of streetlights in safely illuminating roadways.

Fortunately, we can implement solutions to excessive night lighting without inconveniencing the public or business. An international organization dedicated to eliminating light pollution, DarkSky, notes that daylight contains substantial amounts of blue (cool) light, while red (warm) portions of the light spectrum dominate the night sky. DarkSky suggests utilizing light bulbs with warm light, i.e., with a color temperature of less than 3000 Kelvin, at night to avoid simulating daylight exposures. These warmer lights are easier for our eyes to adjust to at night and reduce the impact on humans and wildlife.

As DarkSky notes, reducing light pollution confers economic as well as health benefits. By using the minimum light brightness needed and only lighting areas when necessary, energy savings result. Cost savings from directing light only to where it is needed when it is needed could reach \$3 billion annually in the United States. In addition, reducing electrical use decreases greenhouse gas emissions that contribute to global warming. By preserving dark skies, we can make ourselves healthier and safer while protecting the environment and experiencing the marvel of the natural night sky.

DarkSky recommends that municipalities adopt ordinances and homeowners' associations employ covenants to reduce glare, sky glow and light trespass. In conjunction with the Illuminating Engineering Society (IES), DarkSky developed a model outdoor lighting ordinance based on five principles. Light should be targeted, low level, controlled, warm-colored, and used only if it is needed. This code can serve as a starting point to identify the types of lights allowed and their permissible use.

Lamps can be purchased that direct light down to the area in which illumination is desired, and shield light from where it is not needed. Shielding reflects downward light that would otherwise be directed upward, thereby protecting the night sky and facilitating use of lower wattage lights. Lights can be fitted with dimmers to reduce the luminance to that required. And timers can be used to ensure that lights are illuminated only when needed. Municipal ordinances may also

restrict lumens per acre, contain special provisions for sports fields, and limit light from outdoor advertising signs. Model ordinances are available on the websites of the IES and DarkSky.

Based on the advocacy of Carnegie Mellon University astronomer Diane Turnshek and others, Pittsburgh adopted a regulation to limit artificial night light by, among other things, replacing or retrofitting streetlights. Public buildings and new or major additions and modifications to existing buildings must adhere to the code. Similarly, prompted by advocacy from Smith College astronomy professor James Lowenthal, Smith College and surrounding communities have implemented DarkSky principles. Presentations by both leading dark sky advocates are available online.

Voluntary programs can also mitigate light pollution. In fall 2020, over 1,000 birds died in Philadelphia from building collisions in a single day. In response to the 2020 tragedy, the Academy of Natural Sciences and various Audubon Society and Ornithological Club chapters, formed Bird Safe Philadelphia. This partnership supports Lights Out Philly, part of a national program seeking to protect bird populations by encouraging building owners to turn off lights from midnight to 6 a.m. during the spring (April 1-May 31) and fall (Aug. 15-Nov. 15) migratory seasons. According to Lights Out Philly, turning out lights can reduce up to 80% of bird deaths and approximately 28% of energy costs.

Action on a state level to promote dark sky goals is also possible. For example, if enacted, House Bill 969, the Responsible Outdoor Lighting Control Act, would require commonwealth agencies and related entities installing or replacing outdoor lamps to ensure they are fully shielded, angled downward, avoid light trespass, have a correlated color temperature of 3000K or less and be used only if needed for comfort and safety. Other provisions of the bill would further diminish the use of bright lights, by, among other things, substituting roadway markings for streetlights where appropriate. The bill is under consideration in the House Environmental and Natural Resource Protection Committee.

Courts have recognized that light pollution may adversely impact the use and enjoyment of property. In *EQT Production v. Borough of Jefferson Hills*, 208 A.3d 1010 (Pa. 2019), the borough disapproved the operation of a natural gas production complex. When challenged, the borough presented testimony of residents living near a similar facility. These residents offered evidence of increased levels of traffic and air and light pollution and health effects that diminished the quality of their lives. The court held that this testimony was admissible.

Likewise, in *Delaware Riverkeeper Network v. Secretary of Pennsylvania Department of Environmental Protection*, 870 F.3d 171 (3d Cir. 2017), plaintiffs challenged the approval of an interstate natural gas pipeline project on the ground that it would impact exceptional value wetlands. The court affirmed the agency's approval, in part on the ground that the alternative advocated by plaintiff would increase light and noise pollution and greenhouse gas emissions. See also, *Dine Citizens Against Ruining Our Environment v. Bernhardt*, 923 F.3d 831 (10th Cir. 2019) (reviewing environmental assessments under the National Environmental Policy Act that addressed, among other things, potential light pollution and impact on night skies resulting from federal drilling permits).

Residents of Philadelphia have asserted dark sky claims. For example, in *Armstead v. Zoning Board of Adjustment*, 115 A.3d 390 (Pa. Cmmwth Ct. 2015), plaintiffs challenged a zoning variance allowing the Franklin Institute to change its sign from vinyl to digital. Although the court dismissed the case for lack of standing, the institute agreed to limit the night hours the sign is in use and to equip the sign with automatic dimming control.

Lighting the night sky is harmful and wasteful. Solutions such as those recommended by DarkSky and the IES are available to municipal or state officials promulgating rules to protect public health and safety. Perhaps in the future thousands of stars in the night sky will even be visible from a stoop in Philadelphia.

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