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Blinded by the Light

It is no secret that the use of artificial lighting at night has increased with the use of electronics and various types of outdoor lighting. In fact, a group of scientists at *Science*

Advances found that in the four years between 2012 and 2016, "earth's artificially lit outdoor area grew by 2.2% per year, with a total radiance growth of 1.8% per year" (Kyba et al). While this increase in light may seem beneficial at first, there are many circumstances in which this increase becomes harmful both



Figure 1. This image is a composite of data acquired from satellite images from April to October 2012. Captured by NASA 4/18-10/23/2012. Image downloaded from https://www.flickr.com/photos/gsfc/8247975848 in April 2019.

to human and wildlife health not only globally but also on local levels.

Artificial light at night can be very useful for humans when it comes to safety and convenience. Think of portable lights for reading or electronic tablets that allow us to access nearly anything we need from almost any location we are in. A 2014 survey shows that 90% of 1,508 American adults asked used "some type of electronics at least a few nights per week within 1 hour before bedtime" (Chang et al). Through a study of testing effects on humans of reading e-Readers versus printed books before bed, the researchers conducting the previous survey found multiple helpful results. They discovered that using e-Readers before bedtime "prolongs the time it takes to fall asleep, delays the circadian clock, suppresses levels of the

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sleep-promoting hormone melatonin, reduces the amount and delays the timing of REM sleep, and reduces alertness the following morning." However, there are more resources of artificial light that are also causing the overall decreased quality of sleep.

These issues are not just limited to small, convenient, everyday-use electronics. They also include general artificial lights at night, both in and outside of our homes. While we rely on street lamps, motion sensors and general lights in our home for safety and vision at night, these light resources are contributing to a number of health issues. The International Agency for Research on Cancer (IARC) conducted a study on rodents in Russia with the goal of learning more about the effects of light/dark on health and rodent survival in order to suggest how humans are also affected (Anisimov, et al). After exposing different groups to various forms of lighting (natural light, artificial light, constant light, constant darkness) for certain hours of the day, they discovered constant light exposure had a number of negative health effects on rodents. Specifically, accelerated aging and age-related infertility in female mice and rats as well as enhanced spontaneous tumorigenesis (production of tumors) and shortened life span in both male and female rats. After noticing the negative effects of light on the rodents, scientists gave a portion of them melatonin infused water which "prevented premature aging and tumorigenesis." It was then concluded that "the use of melatonin would be effective for cancer prevention in humans at risk as a result of light pollution."

It does not stop there. Not only are the artificial lights at night negatively affecting human health but they are also negatively affecting the health of the surrounding wildlife. In her paper "Deer in the Headlights: How Light Pollution is Affecting Wildlife," Chloe Bergstrand points out that a majority of nature's animals are either nocturnal or crepuscular (active around sunrise and sunset), surpassing the amount of diurnal (active during the day) animals (Figure 2). It is clear that these nocturnal and crepuscular animals have different capabilities and necessities when it comes to survival, which includes night vision as well as following "specialized activity

Percentage of Animals That Are Nocturnal



Figure 2. This graph shows the percentage of animals that are nocturnal. Data from Chloe Bergstrand "Deer in the Headlights: How Light Pollution Is Affecting Wildlife."

patterns." However, with the increase in amounts of artificial light at night, this is forcing many animals to adapt to a brighter habitat which can cause changes in "eating habits, foraging grounds, mating cycles, biological clocks, and many other habits that evolved in a predominately dark environment" (Bergstrand).

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To bring back the dark sky that many are hoping to see each night, there are parameters each community can take in order to make this happen. Changing the type of bulb used in outdoor lighting as well as the modifying the lighting structure itself is a good start. According to The Dark Sky Association (DSA), low-pressure sodium lights are a better option in environmentally sensitive areas whereas LED lights are more preferred by people when it comes to safety. As LED lights may be more energy efficient, they do produce blue light which has been found to have an even greater influence on the health concern mentioned earlier. However, the benefit of LED lights is that they can be dimmed in areas where less light is necessary but still desired. The DSA also recommends fixtures that are fully shielded at the top which allows for light to be directly pointed in necessary areas (i.e. walkways). As not all cities are directly in control of lighting types, it is up to residents and local businesses to start implementing these changes in order to make the community more aware of the negative effects of light pollution.

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