

DARK NIGHT SKIES, LIGHT POLLUTION, AND WEST HARBOR POND

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Growing up in suburban LA and DC, the first time I saw the Milky Way was during summer vacations to Boothbay Harbor as a child. I used to sit outside for hours, looking for shooting stars, planets, star clusters, and the Andromeda Galaxy, and trying out my first telescope. Maine's night skies are a precious natural resource, but like other dark sites throughout the country and the world, they are threatened by increasing levels of light pollution. Light pollution is not just a concern for stargazers, however; it threatens ecosystems and human health and wastes energy. Fortunately, light pollution is one of the easiest environmental problems to solve. Here, I'll describe why we should care about light pollution, how to improve your own lighting, and how to enjoy Maine's dark skies this month.

Why is light pollution a problem?

Ecologists are only beginning to learn how light pollution affects flora and fauna, but so far, it appears to have a negative effect on nearly every species studied, from clownfish in the ocean to songbirds in the sky. Research scientist Christopher Kyba points out, that for nocturnal animals in particular, "the introduction of artificial light probably represents the most drastic change human beings have made to their environment."

Many West Harbor Pond species are susceptible to artificial light at night. Most mammal species are nocturnal or crepuscular (active at dawn and dusk), including many species native to West Harbor Pond, such as beaver, deer, mink, and fox. Artificial light at night can affect animals' night vision, circadian rhythms, and access to food. Under bright lights, prey species forage less in order to avoid being seen by predators. With light pollution, owls lose the element of surprise over their prey, and birds migrating by starlight and moonlight get thrown off course. Even life in the water is affected. Frogs change their nocturnal croaking and mating patterns, eels' spawning migrations are disrupted, perch sleep less, and bass become more active. Artificial lighting disrupts the natural rhythms and cycles of nocturnal ecosystems.



The Milky Way as seen from Acadia National Park (Credit: NPS Photo/Sardius S. Stalker)

Light pollution is also one of the main causes of the decline in insect populations worldwide. Many insect species navigate by moonlight. Tricked into flying around artificial lights instead, insects die of exhaustion or become easy, visible prey. Under artificial lights, fireflies cannot see each other's mating signals, and their populations are dwindling. Because many species depend on insects for food or pollination, threats to insects are a threat to other species as well.

We humans are not immune to the effects of light pollution, as we too have evolved in a world of bright days and dark nights. Light pollution alters our circadian rhythms and ability to sleep. The American Medical Association has issued warnings about bright, blue-rich lighting at night and its link to diabetes, sleep disorders, cardiovascular disease, and even cancer. The human body naturally produces melatonin, which helps prevent certain cancers, such as breast and prostate cancer, from growing. However, our bodies only produce melatonin in darkness.

In addition to the ecological and health effects of light pollution, we have also lost the stars. Today, only 20% of Americans can see the Milky Way in their night sky. That means fewer artists, poets, scientists, and dreamers inspired by the vastness of space.

What about safety?

The most common light pollution myth is that we need bright lights for safety. In the words of author Paul Bogard, we mistakenly believe that “because some light improves our safety, more light will improve our safety more.” In reality, well-designed lighting is better for both safety and light pollution reduction. Effective lighting illuminates only what we need to see, such as the road or sidewalk, without spilling light into the sky, the pond, the trees, bedroom windows, and other places that should be kept dark. At night, our vision adapts to lower light levels. Lights that are too bright or too blue can create glare and dark shadows, making it harder to see at night rather than easier. Lights should be shielded, so that light is directed to the ground where it’s needed rather than shining into our eyes where it can be blinding. Anyone who has ever been temporarily blinded by a flashlight shining into their eyes knows that poorly directed bright lights do not help you see. Lastly, believe it or not, there is no link between crime and lighting. In 1997, the National Institute of Justice concluded that “We can have very little confidence that improved lighting prevents crime.” This same finding has been supported by more recent studies in London, Chicago, and elsewhere. Bristol, England and Chicago, Illinois even found that increased lighting was associated with *more* crime, as criminals took advantage of the light to work, and FBI statistics show that most burglaries actually happen in daytime.



Left: In the bottom image, a person is hidden in the shadows created by a bright unshielded light. Right: An example of effective, shielded lighting illuminating a walkway. (Credits: IDA, George Fleenor; IDA)

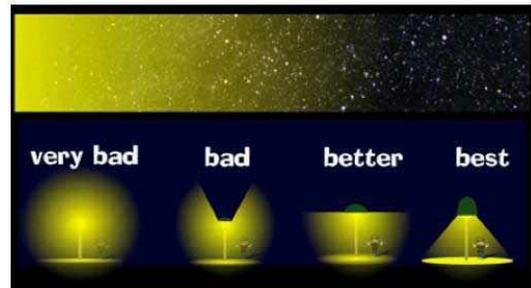
Reducing light pollution is a win-win situation. Better lighting improves our ability to see at night, is better for human health, protects the natural environment, reduces our energy usage, and preserves our night sky.

How to improve your lighting

When considering your outdoor lighting, there are three main qualities to keep in mind: color, shielding, and brightness.

Color: Avoid lights that are blue or bright white in color. Blue light scatters more in the sky and penetrates more deeply into water. Because blue light mimics daylight, it can be more harmful for nocturnal wildlife, human health, and human night vision. Manufacturers often indicate the color of a light by listing its “color temperature”; higher numbers indicate bluer colors. The American Medical Association and International Dark-sky Association recommend choosing lights with color temperatures of 2700-3000 K or less. These lights are often called “Warm White” or “Soft White” rather than “Cool White”. An even redder (and better) option is “Amber” lighting (2200 K), which is now occasionally available.

Shielding: Shields block the top and sides of your light fixture, so that light is directed downward only. A shielded light blocks the light bulb from your view, so that its light isn’t shining directly into your eyes. To find shielded lights, look for light fixtures with the International Dark-Sky Association (IDA) Fixture Seal of Approval. The IDA website has a list of these fixtures and where to buy them.



Unshielded vs. shielded lighting

Brightness: Use only the amount of light necessary for your desired task, and only use lights where they’re needed. Choose lower wattage incandescent bulbs or LED lights with lower “lumens”. Since shielding directs all the light downward, you may find that you can get the same illumination with a dimmer light. Consider putting lights on a motion sensor or timer, and turn them off entirely when you’re not using them. As an added benefit, dimming and turning off lights reduces energy consumption and saves money on energy bills.

How to enjoy the night sky this month

- Dress warmly! You’ll be standing still while stargazing so dress more warmly than you think you need to.
- Turn off your outdoor lights, and draw your curtains or turn off indoor lights. Stand in a place with as few outdoor lights as possible. If you have streetlights near you, position yourself so that trees or other structures block your direct view of them.
- Bring a red-light flashlight so you can see where you’re walking and read star charts without destroying your night vision. If you don’t have a red-light flashlight, you can make your own by wrapping several layers of red cellophane over a white-light flashlight and securing the cellophane with a rubber band.
- Start looking for brighter stars, planets, and constellations first. Your eyes will gradually become more dark-adapted, but it will take at least 20 minutes to achieve full night vision. After 20 minutes, notice how much you can see in the sky and around you.

- To see the faintest objects in the night sky, use averted vision. There's a small central blind spot in human night vision, so you can see fainter objects when you're not looking directly at them.
- You can find a free map of the December Northern Hemisphere sky at skymaps.com/downloads.html. In addition to the Milky Way, this month, you can see the Pleiades star cluster, right by the V-shaped constellation Taurus. My favorite object to find is the Andromeda galaxy, the most distant object you'll see with the naked eye. To find Andromeda, first find the square-shaped constellation Pegasus. From one of the corners of Pegasus moving outward, you reach three pairs of stars, each pair spaced farther apart. This pattern makes up the constellation Andromeda, and the Andromeda Galaxy (M31) is equally spaced above the second pair of stars. Andromeda is a spiral galaxy, like our Milky Way, and is one of our nearest galaxy neighbors.
- There are several astronomical events of interest this month: The Geminid Meteor Shower peaks on Dec. 14 and is visible starting Dec. 4. On Dec. 21, Jupiter will appear so close to Saturn in the night sky that the two planets will look like a single object. They will set below the horizon by 7 pm. This is the closest the two planets have been in the night sky since 1623. For one week before and after the 21st, you should be able to see them simultaneously in the field of view of a small backyard telescope.

Happy Stargazing!

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To learn more, check out:
The International Dark-sky Association (darksky.org)
The End of Night by Paul Bogard