

To: The State and Local Government Committee, Maine Legislature
Re: Public Hearing (10 a.m., May 12, 2025) on LD 1934 (An Act to Promote Responsible Outdoor Lighting)
From: Susan H. Brawley, Professor Emerita of Marine Biology & Plant Biology, University of Maine, Orono, ME 04469 (brawley@maine.edu; office phone: 207-581-2973; Residence: 27 Hamlin St., Orono, ME 04473; cell phone: 207-974-8713)

Dear Committee:

I write in strong support of LD 1934. The text of the bill suggests that it would reverse the growing loss of darkness at night in Maine. Turning night into day has serious health effects on humans and other animals and plants, as described in simple terms in Dr. Travis Longcore's recent article in *Sky & Telescope* (January 2024). I attach that article and also an op-ed from *The Washington Post* by regular columnist Dana Milbank, in support of the points I make after the citations:

1. Longcore, T. 2024. No Creature Comfort. *Sky & Telescope* (January 2024 issue, pages 34-40). Dr. Longcore graduated from Orono High School and is an adjunct Professor at the University of Southern California Institute of the Environment and Sustainability as well as being Co-Chair of USC's Environment and Sustainability Graduate Program.
2. Milbank, Dana (May 5, 2023). "I was busted by the light police. They had a point." Editorial in *The Washington Post* (Milbank is a regular columnist at the Editorial Page of the *Washington Post*—this op-ed mentions that he consulted Dr. Longcore for insights about the problem he'd been "busted for"—and Milbank describes the problem of light pollution for "every reader"). **Pasted at end of my letter.**

I have direct experience with the loss of darkness in Maine. When I first came to Maine (1990), I lived briefly in Levant. It was possible to see the Northern Lights many nights, and the stars were very bright. My husband and I then bought a house in Eddington (1991), which also had dark skies, making it possible to see the Milky Way in all its glory, meteor showers, and the Northern Lights in winter. That lasted only a few years, unfortunately, because the outdoor lights in Old Town and Orono (e.g., at the University of Maine) became **much brighter**, and they dimmed the night sky. It was sad.

The problem of loss of darkness at night extends far beyond missing seeing the stars, however. As Longcore discusses (p. 37): “Nearly every organism that lives on Earth’s surface (as opposed to in the abyss of the ocean or deep in caves) has intrinsic daily rhythms that are kept synchronized by light. Exposure to light at night, even at relatively low levels, can upset those rhythms. Researchers have extensively investigated this for humans, often using mice as a model organism. Exposure to light at night has been associated with a whole suite of diseases, most notably breast, prostate, and several other cancers, as well as diabetes, obesity, sleep disorders, depression, and stress”. See the human figure on p. 38 in Longcore for more information.

Crop maturation times can change in ways that are unfavorable for harvest (see photo in Longcore, p. 37) when lights are too bright and spectrally harmful (LED Kelvin rating too high). Feeding and activity patterns of animals in natural ecosystems are highly vulnerable to LEDs that are unshielded and too bright.

Assistant Professor of Forest Entomology Angela Mech (School of Biology & Ecology, University of Maine, Orono) has advised that brown-tailed moths are highly attracted by blue-white LEDs (high Kelvin rating) and has advised that lights should be turned off at night or yellow (lower Kelvin rating)-LEDs used to prevent your yard becoming a magnet for brown-tailed moths. See: <https://content.govdelivery.com/accounts/MEDACF/bulletins/3a57bf6>.

There are many other important reasons not to over-illuminate at night, which I assume your work session will document further. I was Co-Chair with Mr. Joshua Young (UMaine Facilities) of a committee that Provost John Volin appointed 3 years ago to consider improvements to the campus, and lighting was one area we studied. Dwight Lampher (a lighting engineer on MDI; see <https://darkskymaine.com/resources>) gave us a seminar that was very helpful because he presented data showing that, “Brighter is not safer”. High Kelvin (blue-white color) LEDs cause so much glare that they can interfere with human vision; Mr. Lampher had a dramatic film made in Germany of a burglar who was not evident due to this problem. Our committee recommended to the Provost, after 7 months of research and meetings, that LEDs should not be higher than 3000K, and that many situations would allow lower Kelvin LEDs than that. Intercollegiate athletics have special rules, so the Provost accepted the Committee’s recommendation, but noted that exceptions for sports’ fields might be required. A number of 4000K and 5000K LEDs on campus were replaced with more appropriate LEDs after our Committee’s work for the Provost. I would recommend that Dr. Mech and Mr. Lampher be invited to the Work Session, and I think Dr. Longcore would be willing to participate (He also gave a seminar to our Committee).

Unfortunately, the previous Town Manager in Orono refused a petition signed nearly universally by residents on Hamlin and Mayo Streets---4 years ago---to replace one very bright LED on each of the 2 streets with a lower Kelvin-rated LED. I believe that

LD 1934 would lead to a process at the town level that would require that replacement, and it could not come too soon!

As we know, Maine is still a small community in some ways, and it was helpful in the last neighborhood problem with over-lighting in Orono. A new couple moved next door to me, and the mother of one thought that our neighborhood was too dark for safety on their multiple sets of steps up from the street. She went to a big box store and acquired unshielded, blue-white (high Kelvin temperature) LEDs for each step, and they were in pairs facing each other, shining horizontally and very brightly over a distance of > 60 ft into my backyard. I gave her a copy of Travis Longcore's *Sky & Telescope* article, and suggested that either Dwight Lampher or Travis Longcore would likely be willing to suggest a lighting solution that would satisfy everyone. Fortunately, her husband had gone to high school with Travis' older brother, so she called Travis, who indeed recommended a perfect lighting solution (shielded, and lower Kelvin LEDs). Happiness and neighborly relations followed among us. I think LD 1934 offers the promise of preventing "light problems" becoming as concerning as this was, temporarily, for us all.

I would be interested in participating in the Work session for LD 1934 (depending upon its scheduling with respect to my ongoing experiments); however, while I know about light sensitivities of a number of marine organisms from teaching about it, this is not my research area. Need has made me become better informed...

I very much hope that LD 1934 (or a close version of it after the work session and your deliberations) will be adopted. I would hope it could be implemented as soon as possible.

Lastly, we should remember that we are blessed with an International Dark Sky Park (Katahdin Woods and Waters National Monument, so designated by International Dark Sky in 2020 [<https://www.nps.gov/kaww/learn/news/katahdin-woods-and-waters-national-monument-designated-as-international-dark-sky-sanctuary.htm>]), and I have been told that there is growing economic benefit of the Acadia Night Sky festival and the Katahdin Woods & Waters designation. Let's bring back more of the darkness at night that we have lost---for our health, to maintain natural ecosystems, and to attract more tourists!

Thank you very much for your consideration of LD 1934.

A handwritten signature in cursive script that reads "Susan H. Brawley". The signature is written in black ink and is positioned centrally below the text of the letter.

Susan H. Brawley, Ph.D.
Professor Emerita of Marine Biology & Plant Biology

I have copied Dana Milbank's Washington Post piece on the following pages (photos did not copy).



Opinion

Dana Milbank

I was busted by the light police. They had a point.

May 5, 2023

Just eight weeks after I bought a place in the Virginia countryside, I was busted by the light police. First came an email from somebody who lives across the valley from me. "Your new place has a lot of intense white, all-night exterior illumination that I don't recall before," he wrote. "From our front windows, it sort of looks like the scene in 'E.T.' where the spaceship has landed."

I apologized, explaining that I had merely turned on the existing exterior lights of the home, which had been vacant, and therefore dark, for months. I said I would install some new bulbs that brighten only when motion is detected, and I thought the matter closed.

Two weeks later, I got another email. The guy across the valley had turned me in to the "Dark Sky Committee" of the Rappahannock League for Environmental Protection. The committee wrote to say it had been made aware of my lighting and it was prepared to send a representative to my home to "help you figure out your best options" to darken the mood.

I fought for my right to light. "I won't be bullied," I told a member of the committee. Happily, I remain a free man today and have thus far avoided a dark cell in lighting jail.

It was an annoying welcome to my new community — but in retrospect, I'm grateful to the Dark Sky Committee. Its members have no authority (there's no law restricting my lumens), but they were persuasive. It turns out my lights weren't doing much harm to neighbors, but they were doing a whole lot of harm to other living things.

Night skies have been getting nearly 10 percent brighter per year over the past decade, American and German researchers reported in January, a doubling in brightness every eight years. The dramatic growth of LED lights, and the bluish, short-wavelength light they give off, compounds the "skyglow" effect of light pollution. Light-polluted skies cover an estimated 80 percent of the world's population and 99 percent of the U.S. and European populations, another international group of researchers found several years ago.

Here in North America, 80 percent of us can no longer see the Milky Way when we look at the night sky.

That's a shame for humanity. But it's much worse for the insects, birds, reptiles and mammals that have had their ecosystems disrupted by the sudden change. In the evolutionary blink of an eye, artificial light has altered migration, mating, foraging, pollination and predation rhythms that developed over eons. Light pollution isn't as severe an ecological threat as climate change or habitat loss, but it's accelerating the decline of many animal populations. And, unlike climate change and habitat loss, this problem has a cheap and painless fix: Just turn down the damn lights.

I asked Torney Van Acker, a retired engineer on the Dark Sky Committee, to visit my home one night for a demonstration. With my "E.T."-spaceship lights on, we stood outside and he aimed his light meter at the zenith. Using a measure of brightness called "magnitude per square arc-second," the brightest, Monday-Night-Football night sky is about 16 mpsas, and the darkest sky, with zero light pollution, is 22. The sky above my home scored 18.65 — what you'd expect in a brightly lit suburb.

We turned the lights off and the darkness score shot up to 21.23 — that's *100 times darker* than before, Van Acker said, and typical of a rural night sky. Though there was a crescent moon and still a faint glow in the West from the setting sun, thousands of stars revealed themselves as our eyes adjusted. The Big Dipper pointed us to the North Star and to Deneb, which led us to Vega and the Lyra constellation in the northeastern sky, from which a shooting star, part of the Lyrid meteor shower, streaked above us. The Milky Way formed a river from horizon to horizon.

"You've got a good sky," Van Acker remarked. I felt oddly flattered — and suddenly protective of it.

This was the sky humans took for granted for almost all of our history. In 1901, the conservationist John Muir wrote that "the floods of light from the stars ... must always be wild, for man can change them and mar them hardly more than can the butterflies."

He was wrong. Man found a way to blot out the floods of light from the stars. "For 4½ billion years there was no artificial light at night. It's really only in the last five human generations that we transformed that," says Ruskin Hartley, who runs the International Dark-Sky Association in Tucson. "It's one of the most profound transformations of our environment."

Light pollution, along with climate change, pesticide use and habitat loss, is driving the decline of some 40 percent of insect species, with the global population of insects shrinking by an estimated 2 percent per year in what some call an "insect apocalypse." That threatens the pollination of crops and plants and, ultimately, the entire food web. Light pollution is also contributing to the decline in bird population. The number of birds

in the United States has dropped by 29 percent since 1970, which means nearly 3 billion fewer birds in our skies, according to a comprehensive study by the Cornell Lab of Ornithology and others.

Insects, drawn to light, are fried or become easy targets for predators. Bright lights lure nocturnally migrating birds and sea birds into the danger of urban areas, and millions of birds die in collisions with floodlit buildings and communications towers. Sea turtle hatchlings are likewise drawn to artificial lights — and into the jaws of predators.

Lights at night also act as barriers to nocturnal animals, ranging from bats to mountain lions, fragmenting their habitats and marooning them on ecological islands. Predatory creatures — certain snakes, salamanders, small mammals, insects — that rely on the darkness of a new moon to find food no longer have that protection.

“The dark places are a refuge,” says Travis Longcore, a professor at UCLA’s Institute of the Environment and Sustainability. But now, “you have light pollution and skyglow that is as bright as the full moon,” and that means certain animals “don’t come out to forage when they should because it’s a danger signal if it’s too bright.”

Animals find their circadian and seasonal rhythms disrupted by artificial light. Urban birds call earlier in the morning, altering the mating process. Plants produce flowers and fruit at the wrong times. And humans lose sleep because of artificial light (whether from streetlights or our digital devices), potentially contributing to increased obesity and cancer.

“There’s days of research that one could go through on how physiology is affected,” Longcore says, “but it all makes sense when you think that this planet has had day/night and lunar cycles for the whole period of the evolution of life.” Until now.

The good news is the damage could be easily reversed. The biggest share of light pollution comes from commercial sources — gas stations, strip malls and the like — followed by outdoor sports facilities. After that comes residential lights, streetlights and industrial lights. Municipalities can regulate much of that light pollution, and some already do: dimming streetlights during certain hours, requiring dark-sky-friendly exterior lights in new construction and renovations, and simply turning off lights that serve no public safety purpose.

Each of us has control over residential light pollution, which contributes roughly 10 to 20 percent of the total. I called in the light police to show me what to do. They toured the perimeter and gave me a battle plan.

When I eventually update the house, they advised, I should lose the floodlights and the candelabra-style porch lights and sconces. Those fixtures, by exposing the naked bulb, scatter light upward and sideways rather than downward, where it is needed. Replacement fixtures (the International Dark-Sky Association has a list of approved ones) should face down and the canopy should shield the bulb on the top and sides. Dimmers and timers help, too.

Even without replacing the items, there are plenty of cheap fixes that I’ve already made: motion-detecting smart bulbs; “warm” bulbs (ideally 2700 kelvin or less) that cast a yellowish hue rather than the bluish one that contributes most to skyglow; nothing more than 1500 lumens, or about 100 watts; and, of course, turning off some lights. The last act requires me to suppress my fear of the dark and to remind myself that more illumination doesn’t necessarily mean more security.

The bugs haven’t told me so themselves, but I’m guessing they feel better now, and so do I. In the end, Van Acker, of the Dark Sky Committee, played the good cop. “You’re one little fish in a pond,” he reassured me. “Your lights aren’t going to make much difference one way or the other. But it’s all cumulative.”

To spread the gospel, Van Acker and his committee got the Rappahannock County Park certified as an International Dark Sky Park, one of only two in the capital region. (The other is Sky Meadows State Park in Delaplane, Va.) Now, they’re trying to get dark-sky friendly lighting at a massive, 761-unit housing and retail development called StoneHaven going up just across the

county line, near Warrenton, Va. So far, the developers — the Lennar Corporation and Saadeh Partners — haven't complied. (Neither developer responded to my inquiry.) Developments such as those are lighting up rural night skies. Since the Rappahannock County Park earned its certification in 2019, the skies above it have brightened measurably, to 21.2 mpsas from 21.3.

Standing with me in the park one night, Van Acker pointed to a glow in the north: "That's a light dome from Front Royal." To the east, the clouds reflected the lights of Warrenton. To the south, a light dome from Culpeper. To the west, over the mountains, a light dome from Luray. A park neighbor's floodlights and planned construction in Washington, Va., are bringing the light pollution ever closer.

But there's still something special about the night skies over this piece of the Virginia piedmont. On a clear night such as this, 4,000 stars are visible. In the capital, I can see perhaps a dozen. Outside of Maine and West Virginia, it's "about the darkest corner of the East Coast," Van Acker tells me.

"Dark" is a bit of a misnomer. On this night, the sky bursts with starlight. In the West, Venus and the Seven Sisters dazzle. Overhead, Ursa Major and Leo sparkle. And every now and then, another Lyrid meteor streaks out of the northeast at 29 miles per second. When the ancients gazed heavenward, they saw much the same sky. Ptolemy mapped the same constellations. The Chinese recorded their observation of the Lyrid meteor shower more than 2,700 years ago.

Will we be among the last to see such wonders before a haze of man-made blue light conceals the night sky from future generations? We owe it to them, and to all creatures that depend on the dark, not to let that happen.