

THE FADING UNIVERSE

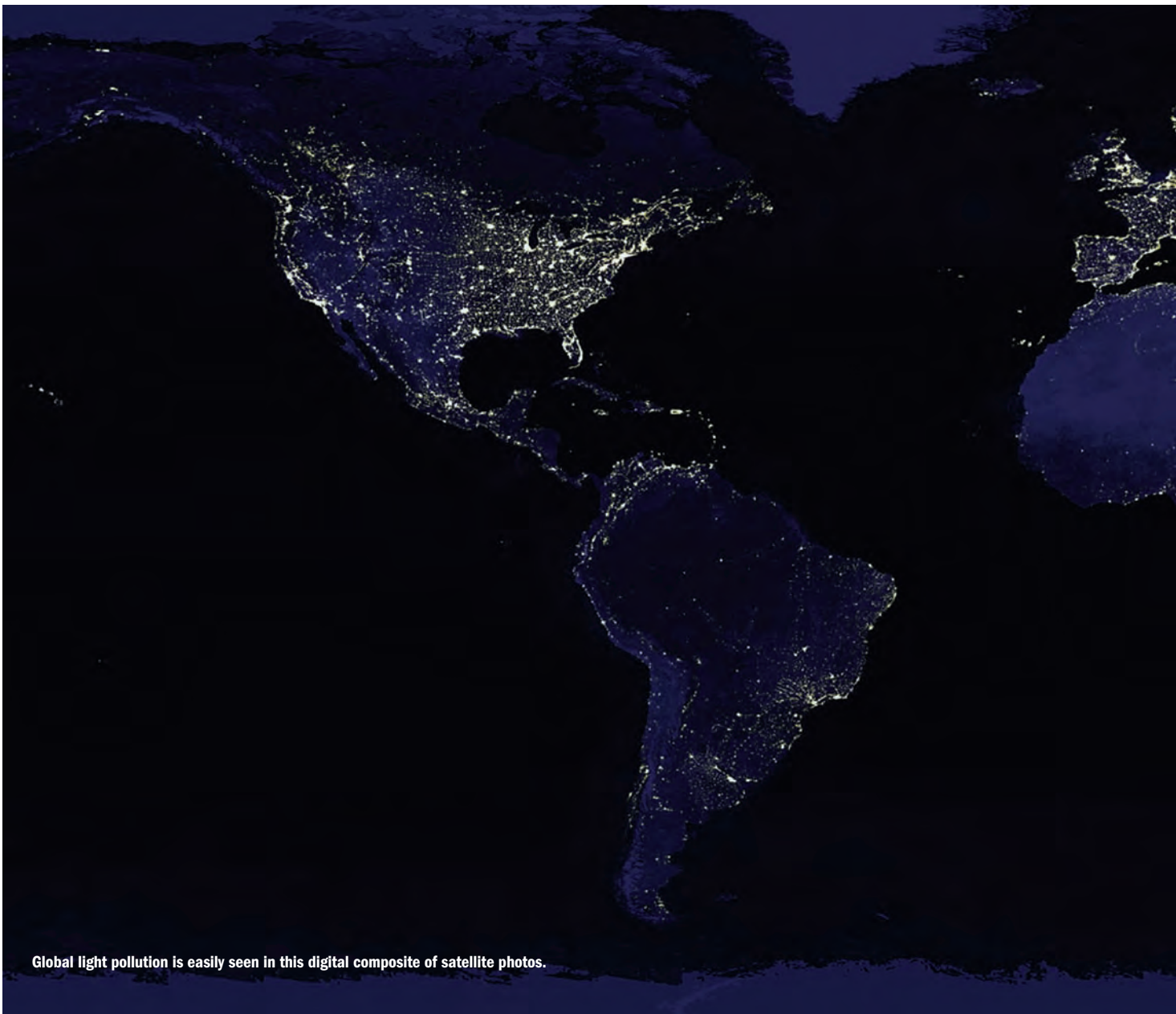
Star-spangled nights should be available for all to see and enjoy, but for most are barely visible. Light pollution, like a milky cataract, is blurring our celestial vision.

Kurt Sroka

Sky glow reflects the city lights from Salem, Oregon and surrounding communities in the cloud cover near Mt. Washington, about 100 miles away from where photographer Ben Canales took this photo. Note the stark contrast between the yellowish glow from city lights and the sparkling stars shining above.



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Global light pollution is easily seen in this digital composite of satellite photos.

Twilight waned as the night rose in the east. Acrobatic bats swooped and rolled for insects. My telescope, pointed skyward, was poised for an evening of stargazing. The night lights and constellations began to appear and brighten. Then a false twilight cast by communities near and far started to spread and intensify. Light pollution, way out here in the country. Bright enough at my location to severely dim the stars above the eastern and southern horizons, and erase stars altogether in the southwestern sky. Our dark skies and starry nights are much more faint.

Light pollution has been deleting our view of the Milky Way galaxy and the universe beyond since the 1950s. It's as though we've been building a shield of light around the planet afraid, perhaps, to view the infinite that surrounds us even as we seem to fear the

dark here on Earth.

Light pollution is evident everywhere. Even in a rural state like Wisconsin, the ubiquitous light domes of our communities are conspicuous. Far out to sea "the sky is not as dark as it was even 20 years ago," according to

marine ornithologist Dr. Richard Podolsky. Coastal cities, offshore oil rigs, cruise ships and fishing fleets all contribute to this phenomenon.

Though still considered a nonproblem by many, light pollution is more than a minor nuisance. It wastes money and energy. It contributes to global warming and is recognized as a health hazard. Here in the United States about \$2 billion a year is spent on lighting that creates useless sky glow. Wasted lighting is responsible for about 38 million tons of our annual carbon dioxide emissions. A lot of megawatts are generated, distributed and then thrown away on unwanted light. (Read more at darksky.org, the website of IDA, the International Dark-Sky Association.) Studies of



C. MAYHEW AND R. SIMMON, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION/GODDARD SPACE FLIGHT CENTER

disrupted hormone production, brain activity, cell function and other changes in birds, bats, frogs, fish and people have been ascribed to light pollution.

Light pollution, defined by the IDA as “excessive and inappropriate artificial light,” has four components that can act independently or in combination:

Light trespass describes when light falls in places where it isn’t intended, wanted or needed. Examples include home security lights that spread a wide beacon and stray onto neighboring properties, street lights that are poorly collimated and illuminate much more than the streets, and parking lot lighting that wanders away casting light in too wide an area.

Glare is excessive brightness. This

causes visual discomfort and the overload will actually decrease visibility. So-called mercury vapor “farm yard” lights are dazzling sources of glare.

Clutter is a profuse grouping of light sources. Major tourism strips, outdoor sports arenas and other places with groups of attractions contain notable examples. Developed strings of commercial properties like Bluemound

Road between Waukesha and Milwaukee are very brightly lit at night. Indeed, you can find examples in the vast majority of communities with clusters of businesses, car lots and malls. The proliferation of clutter greatly contributes to light pollution.

Urban sky glow is the brightening of the night sky over inhabited areas. This is what I see from my rural home in

GAUGING LIGHT POLLUTION NEAR YOUR HOME

An easy way to gauge light pollution levels near home is to look at the Little Dipper. Its stars are rather faint, except for Polaris, the North Star at the end of the handle, and the two stars in front of its bowl called the “Guardians of the Pole” because they march around Polaris like sentries.

The four stars in the bowl of the Little Dipper are composed of stars with magnitudes of 2, 3, 4 and 5. So, if you can see all four stars in the bowl, you have access to a good, dark sky. If you can only see the Guardians, your sky quality can be considered fair-to-poor.

Joe Rao, *SPACE.com Skywatching Columnist*

western Wisconsin. Because of sky glow, millions of people in the United States and billions worldwide are unable to see the Milky Way. Indeed, photographed from satellites, a poster entitled "Night View" shares a stunning image of Earth that clearly shows how urban sky glow interferes with our view of the heavens. You can see many such images by entering "Night Views of the United States" in a computer search engine.

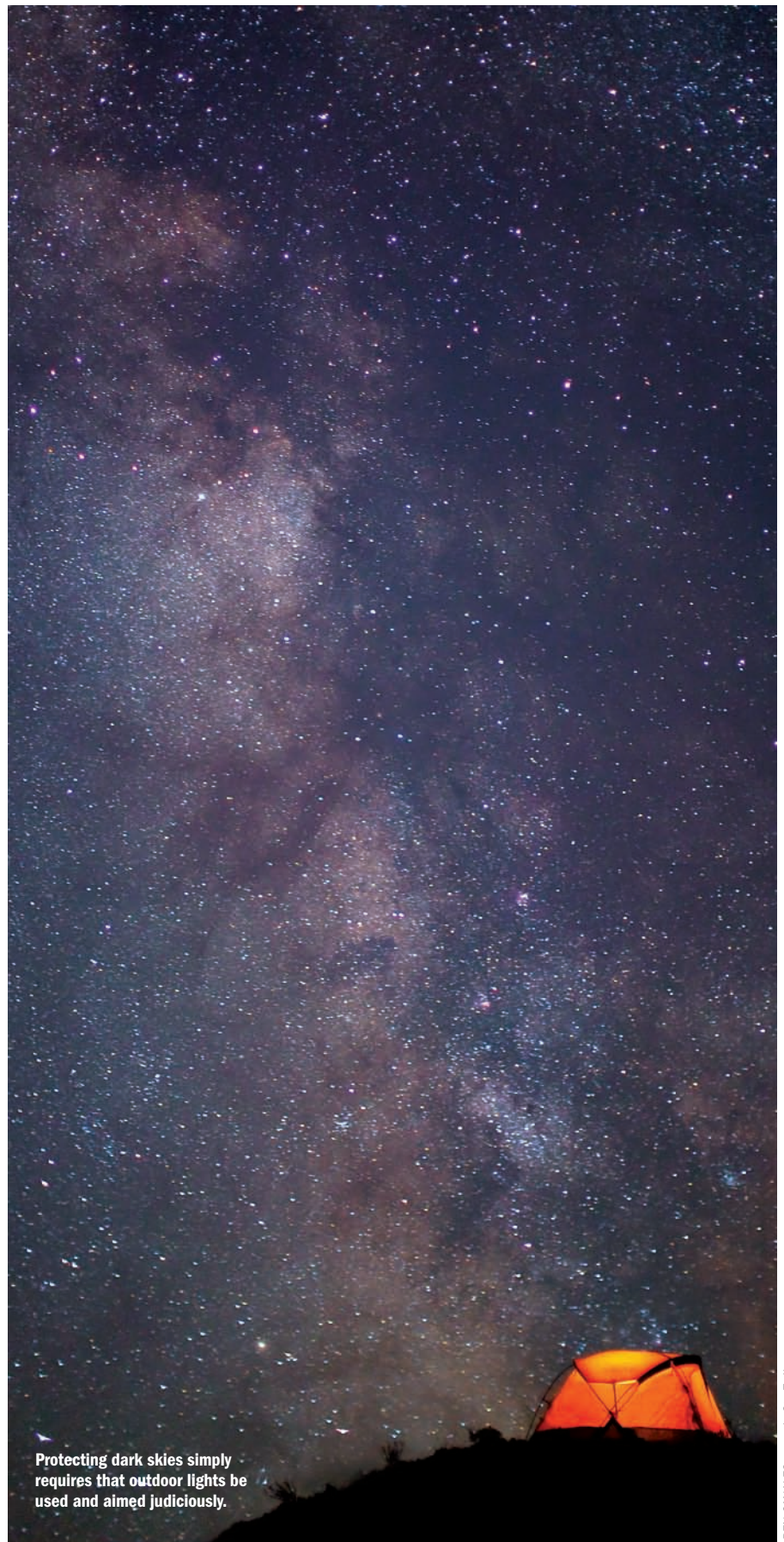
Given that light pollution can be expensive, wasteful and aesthetically unpleasant, how did this phenomenon come to be and why does the overlighting trend continue?

Since the first campfires and the feeling of safety and warmth they brought, people have practiced a philosophy that "more is better." Homeowners, lighting contractors, builders and community officials alike are often still stuck in a rut that bright night lighting is "the way we've always done it." We play on fears and believe that more lighting prevents crime. In fact, nobody really knows. Still, the ideas are well entrenched and it's difficult to convince people to cut back or to contain night lights.

Education, of course, is a first step. Second, too few people have spent time far enough away from community lights to appreciate what a dark sky can reveal. Third, reclaiming the night sky is a long-term process. It can be expensive and time consuming to replace outdated street lights, residential lights and business lighting. It's obvious that reductions will only occur gradually, just as the escalation took decades.

Still, some steps can be taken now. If you're interested in reducing your own "photon footprint" while improving efficiency, search around a little and notice where you see softer, more pleasant lighting when you take night walks. Residential and commercial bulbs and fixtures are available. IDA offers helpful lighting tips.

Don't overlook your local electric utility as a source of help. Many electric utilities and co-ops are actively promoting power conservation and efficiency. There are plenty of alternatives to inefficient, dusk-to-dawn mer-



Protecting dark skies simply requires that outdoor lights be used and aimed judiciously.

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Night view of the United States dramatically shows how the concentration of lights in urban areas reduces our ability to see the wonder of starlight. Light shields designed into artificial lighting can focus night lights where we want them and save energy at the same time.

NASA GODDARD SPACE FLIGHT CENTER SCIENTIFIC VISUALIZATION STUDIO

PRESERVING DARK SPACES

Parks and forests have few artificial lights and are often far enough from town to make wonderful places for stargazing. At Wyalusing State Park in southwestern Wisconsin south of Prairie du Chien, a local astronomy club has its own designated area for night viewing including an interpretive center. Diagonally across the state in the northeast, there's talk about taking steps at Governor Thompson Centennial State Park to install lights that preserve the darkness to maintain a stunning view of the night sky to the north. The park, about 15 miles northwest of Crivitz along the Caldron Falls and High Falls flowages, is far from city lights. The 2,800-acre park adjoins a 3,000-acre flowage and 9,370 acres of the Peshtigo River State Forest.

Dark sky preserves and reserves are a recent notion designed to maintain areas free of artificial lights so they remain superb places for astronomical observation. The world's first International Dark-Sky Reserve was designated in 2007 around Mont Megantic, Quebec, a few miles north of the border with Maine and New Hampshire. Natural Bridges National Monument in Utah was the first property designated as an International Dark-Sky Park.



HOW MANY STARS CAN YOU SEE?

According to SPACE.com columnist Joe Rao:

- **3,000,000,000** stars in the Milky Way
- **8,500** stars are visible with the naked eye (magnitude 6.5 or less)
- **4,250** stars are below the horizon or obscured near the horizon by atmospheric absorption
- **2,500** stars are visible once one accounts for cloudy skies
- As few as **15** stars are visible in cities where street lights, sky glow, glare, clutter and buildings obscure the night sky.

THE GEMINID METEOR SHOWER, COMPOSITE SHOT, PIERRE MARTIN, ORLEANS, ONTARIO

cury vapor “security” lights that cast a pall of glare, light trespass and sky glow.

Convincing community officials of the need to enact outdoor lighting codes is an essential step on the road to taking back the night. It takes persistence and education. As of this writing, the Wisconsin Skies portion of the IDA website (darkskywisconsin.uwex.edu) lists only 33 Wisconsin communities that have enacted lighting ordinances, and the quality of those ordinances vary from comprehensive to a mere mention of the subject under the zoning subsections entitled “nuisances.” Until cities, villages and towns take meaningful, enforceable actions to halt and reverse light pollution, the chances for the widespread return of Wisconsin’s dark skies are slim, or should I say “dim?”

Yet practical solutions for halting light pollution are available now, further research and development isn’t needed. Communities can take practical actions to achieve the goal of efficient, effective and reduced outdoor lighting.

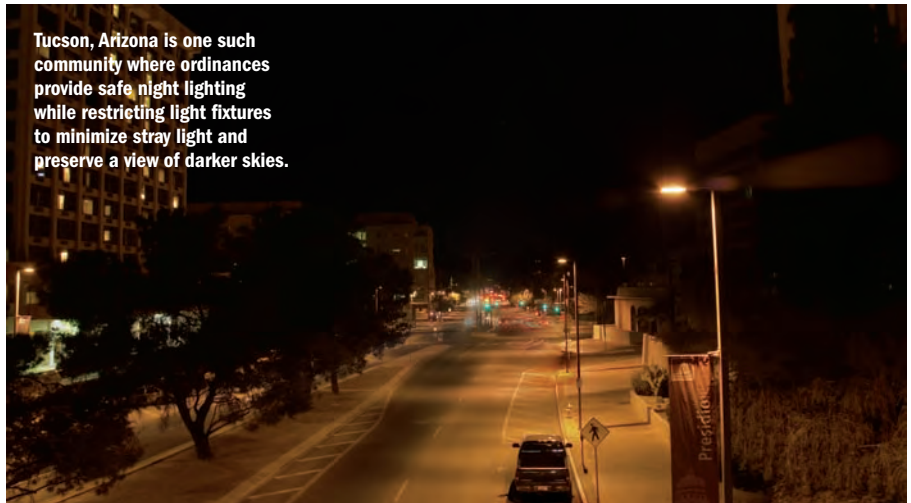
Ironically, though communities often think of extra lighting as providing a safer environment, there are safety concerns from overlighting as well. Communities should think about using only as much light as is needed. Glare is visually uncomfortable and reduces visibility. Too much light interferes with night vision, impeding one’s ability to see beyond an illuminated area. Reduced lamp wattage can actually increase visibility and safety while reducing costs.

Around your home, use lighting only where and when it’s needed. Timers and motion detectors can help achieve this end. Consider where and what you are illuminating and why you are doing so. Think about how your lighting affects neighbors just as you now try to control noise to minimize disturbances.

Shine lights down rather than up. Well designed fixtures aim light where it’s needed — towards the ground. They are fully shielded and can include “cut-off” units that don’t allow light to leak towards the sky. Such fixtures for residential and commercial use are featured in the IDA Fixture Seal of Approval program.


Use efficient light sources. Because

Tucson, Arizona is one such community where ordinances provide safe, night lighting while restricting light fixtures to minimize stray light and preserve a view of darker skies.



fully shielded fixtures direct the light to only where it’s needed, lower wattage lamps can often supply sufficient light for the task. This is good for the environment, good for the wallet and provides more efficient, effective and pleasing outdoor lighting results.

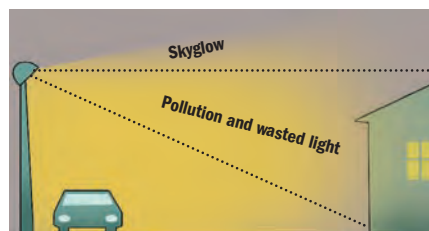
Light pollution can be stopped and reversed, but only if we exercise the collective will to do so. The glow from

our “campfires” can be dimmed without compromising our safety and security. Perhaps, over time, the fading universe will again be visible everywhere, illuminating our sense of awe and sparking our imaginations as it has done since humankind first gazed in wonder at the nighttime sky. 

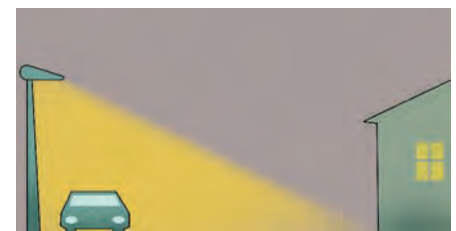
Kurt Sroka writes from Somerset.

DARK SKY TIPS

- **Use light only when and where it’s needed.** Turn off lights when they are not needed and create a curfew for lights-out. Use timers and motion detectors to minimize light use.
- **Use only as much light as is needed.** Excessive lighting reduces the eye’s ability to see outside of the lit area. Excess light can also produce glare, which reduces visibility. Select the correct lamp wattage for your needs to increase safety and reduce energy costs.
- **Shine lights down, not up.** A well-designed fixture will direct the light where it’s needed most — at the ground. Select new fixtures that are fully shielded; retrofit or replace poor quality fixtures. Look for fixtures recommended by the International Dark-Sky Association Seal of Approval program.



Conventional floodlighting



Shielded lighting designed to direct light to the ground

- **Use efficient light sources for outdoor lighting around homes and businesses.**

Consider LED and compact fluorescents for good, energy efficient, economical lighting. Low-wattage lamps give plenty of light for most properties and applications, and in a fully shielded fixture, make an excellent choice. When higher wattage lamps are necessary, be sure that they are fully shielded and energy efficient.

From the International Dark-Sky Association