

Dark Skies in New Mexico

NM DarkSky

A chapter of DarkSky International

An amazing New Mexico resource: dark skies

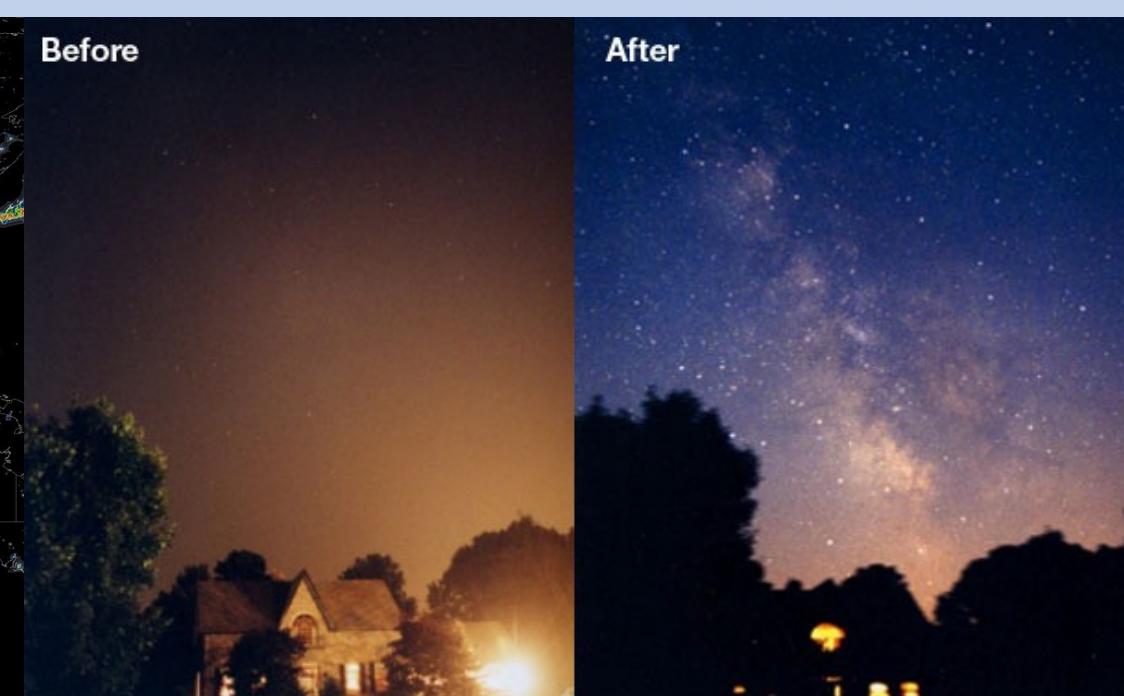
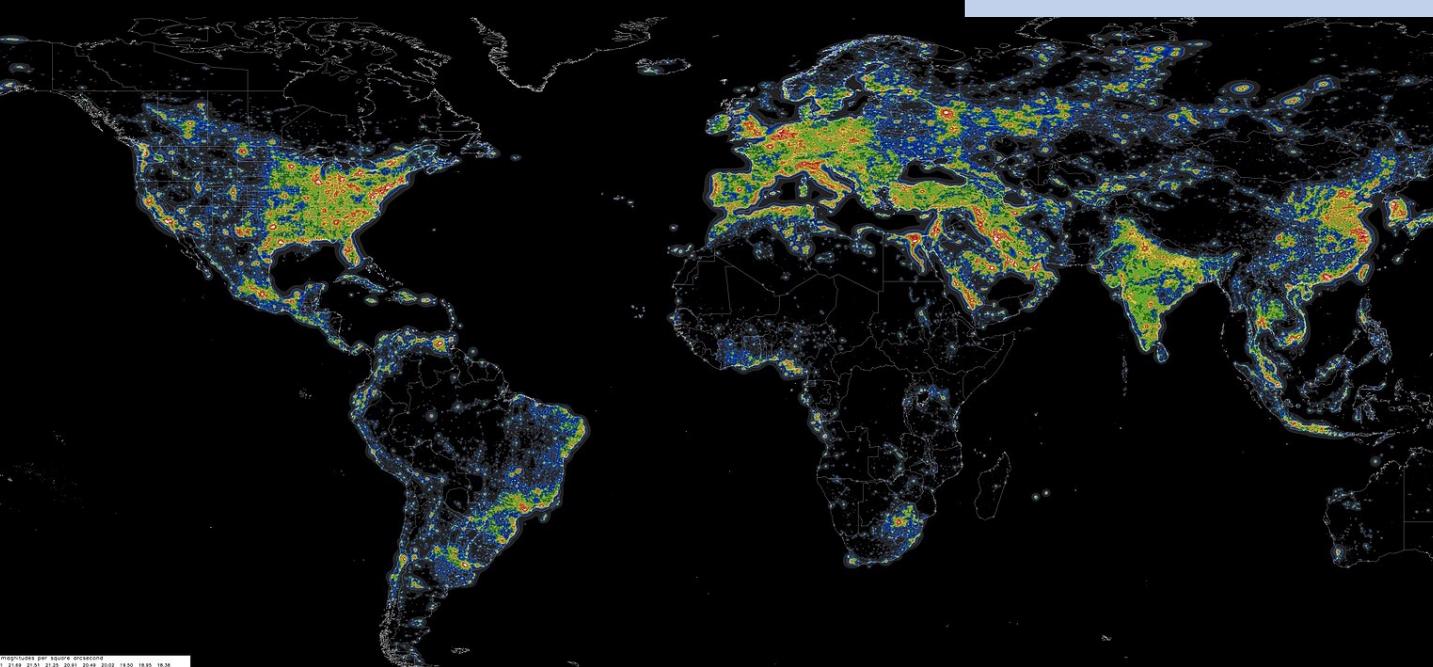
Dark skies show stars moving at night above El Morro National Monument's Inscription Rock. Located in west-central New Mexico, this national park is one of the state's Dark Sky Places, certified by DarkSky International in 2019. Photo by Derek Wallentinsen, New Mexico DarkSky.





IN NM, WE ARE LUCKY!

- ONLY 2 OUT OF 10 PEOPLE ON EARTH CAN SEE THE MILKY WAY
- 99% OF THE USA AND EUROPE LIVE UNDER LIGHT POLLUTED SKIES
- MANY MAY ONLY SEE A HANDFUL OF STARS
- IN NM, WE ARE LUCKY! FOR NOW





Light pollution is increasing at 9.6% per year*



WHAT IS LIGHT POLLUTION?

Any adverse effect on humans or other animals from artificial light at night.

Can take several different forms



SKYGLOW

GLARE



LIGHT TRESPASS

Why care about dark skies?

- Cultural heritage and perspective on our location in the Universe
- Ecological impacts
- Human safety and health
- Energy and money savings
- Science
- Economic impact

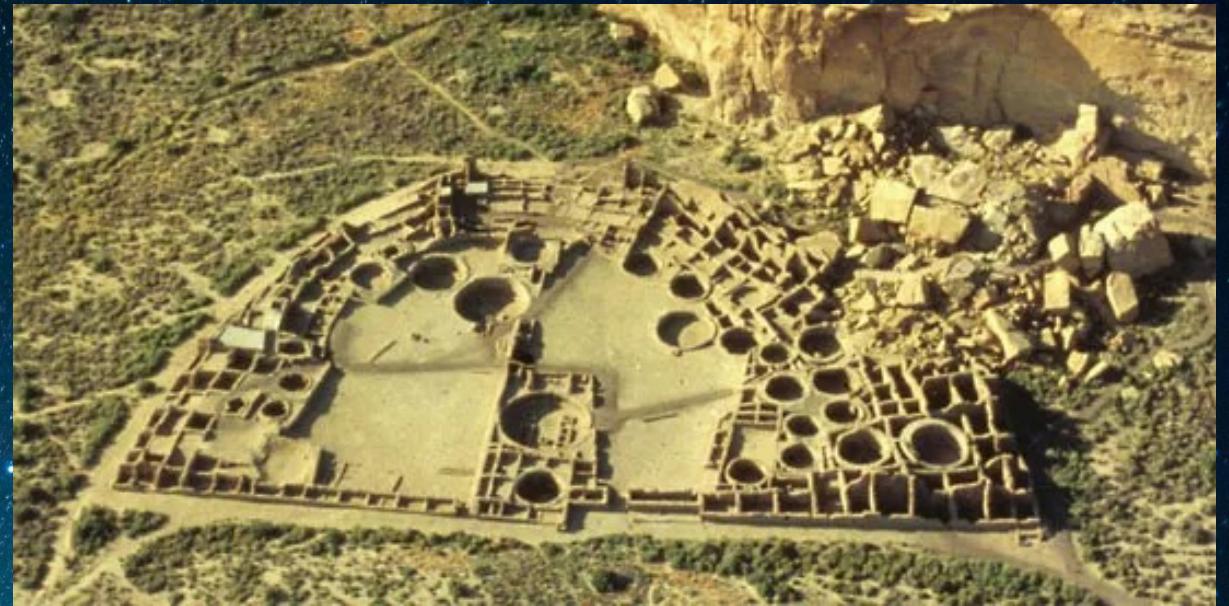
Cultural importance of dark skies

Dark skies have been an important component of different civilizations throughout human history

It is only very recently that we have lost them

In the modern world, some perspective on the Earth's place in the cosmos is invaluable

For many people, seeing the Milky Way, or Saturn and its rings through a small telescope can be a life changing experience



Ecological effects of light pollution

MOST BIRDS IN NORTH AMERICA ARE MIGRATORY

70%

of terrestrial recurring birds are migratory.

80%

of those birds migrate at night.



INTERNATIONAL DARK-SKY ASSOCIATION



CONSERVING THE JEWELS OF THE NIGHT

Firefly-Friendly Lighting Practices



The Milky Way lights up the night sky over a field of fireflies. Views like this are becoming increasingly rare as artificial light at night diminishes natural darkness, competing with fireflies that use bioluminescence to communicate. However, there are many ways to make your lighting less disruptive to nearby fireflies.



The big dipper firefly (*Photinus pyralis*) is one of our most commonly encountered species.

How Are Lights Harmful to Fireflies?

Artificial light at night, or ALAN for short, may be one of the main drivers of firefly declines. At least 80% of the firefly species found in the United States and Canada communicate with each other using bioluminescent light signals in the form of flashes, flickers, or glows. These species are active at dusk or after dark, and artificial lights that are on at this time can make it harder for them to see each other. It may also make fireflies more vulnerable to predators that would otherwise be repelled by their light. The resulting decreases in reproduction and survival could have severe consequences for firefly populations.

Where Does ALAN Come From?

ALAN can be caused by street and house lights, vehicle headlights, billboards, and even gas flares from oil fields. It is usually classified into three types, all of which can affect firefly populations:

1. Skyglow: this glowing haze over urban areas makes it hard to see the stars.
2. Light trespass: this occurs when light at ground level spreads beyond its intended or needed area.
3. Glare: this is any light that excessively illuminates areas or objects and can have a blinding effect.

Unfortunately for fireflies (and many other nocturnal and crepuscular animals), the night sky is brightening rapidly all over the world. The United States and Canada have reached the point where only a handful of areas are truly dark at night. In fact, 80% of people in North America can no longer see the Milky Way under even the clearest conditions, because it is obscured by skyglow.

Human safety/health concerns related to lighting

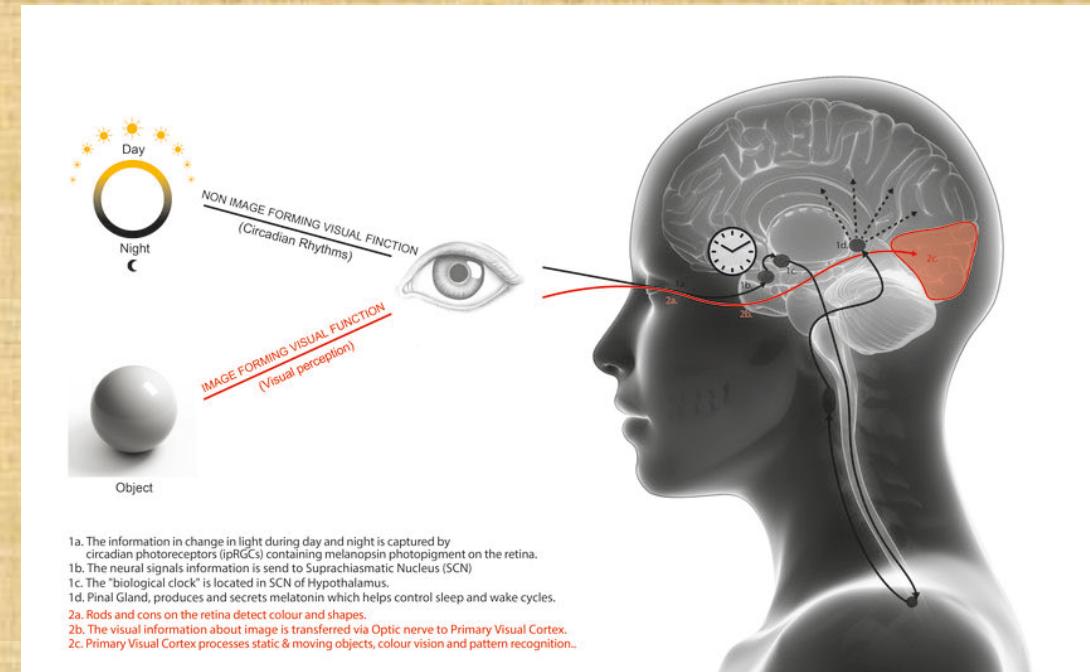
Disability Glare results in decreased visual acuity and reduced driving visibility.

A 4000K LED is emitted as blue light that the human eye perceives as a harsh white color. Our pupils constrict, and we can't see as well. A "veil of illuminance" leads to discomfort and reduced visibility.

Eye Damage: Blue wavelengths create more scattering of light in the human eye and potential damage to retinas.

Disruption of Circadian Rhythm via melatonin suppression (LEDs 5x).

Secondary negative health effects from chronic sleep disruption: increased risk of cancer, diabetes, cardiovascular disease, and obesity.



Zielinska-Dabkowska and Xaviab. 2018. An overview of cognitive and biological effects of city nighttime illumination including a London case study.



George Fleec

MYTH: MORE LIGHTING IS SAFER

REALITY: WELL DESIGNED
LIGHTING IS SAFER
ELIMINATE GLARE

Lighting and safety

A [2015 study published in the Journal of Epidemiology and Community Health](#) found that streetlights don't prevent accidents or crime, but do cost a lot of money.

" A [1997 National Institute of Justice study](#) concluded, "We can have very little confidence that improved lighting prevents crime."

A [Chicago Alley Lighting Project](#) showed a correlation between brightly lit alleyways and increased crime.

Most property crime occurs in the light of the day. And some crimes like vandalism and graffiti actually thrive on night lighting.

Outdoor lighting is intended to enhance safety and security at night, but too much lighting can actually have the opposite effect. Visibility should always be the goal. Glare from bright, unshielded lights actually decreases safety because it shines into our eyes and constricts our pupils. This can not only be blinding, it also makes it more difficult for our eyes to adjust to low-light conditions.

Dark sky does not necessarily mean a dark ground. Smart lighting that directs light where it is needed creates a balance between safety and starlight.



Light pollution wastes energy and money

3-7 BILLION DOLLARS

spent every year on unneeded lighting

21 MILLION TONS OF CO₂

burned by unnecessary lighting



Science

- New Mexico is home to several world class observatories associated with our Universities that are doing important science
 - Apache Point Observatory
 - Magdalena Ridge Observatory
 - (Very Large Array)
- Not only do these observatories produce science, but they also attract students, bring visitors into the state, and employ dozens of people!



Artist impression of the completed MROI array
Image of the array: Andras Olivares. Aerial Image: Tyson Eakman.

Tourism and economic impact

- New Mexico True tourism campaign
- Residential astronomical communities
- Telescope hosting sites
- Economic impact of universities and observatories
- Star parties, etc



Light pollution is reversible!

- Light pollution can be minimized **and still allow for responsible lighting**
- Two organizations have been working on solutions:
 - Illuminating Engineering Society
 - DarkSky International

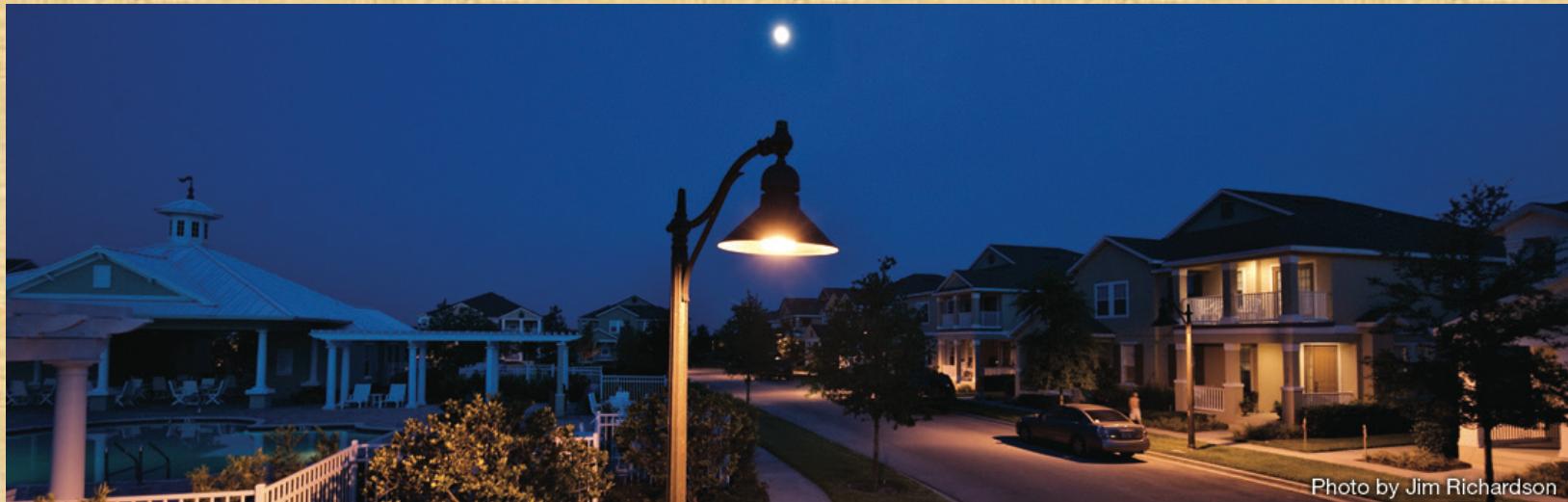


Photo by Jim Richardson

Illuminating Engineering Society

About The IES

The Lighting Authority

Established in 1906, the Illuminating Engineering Society is the recognized technical and educational authority on illumination. Our mission is to improve the lighted environment by bringing together those with lighting knowledge and by translating that knowledge into actions that benefit the public. We provide a variety of professional development, publications, networking and educational opportunities to our membership of engineers, architects, designers, educators, students, contractors, distributors, utility personnel, manufacturers and scientists in nearly 60 countries. Through our American National Standards Institute (ANSI) accredited process, we publish and maintain the Lighting Library®, with over 100 standards written by subject matter experts in our technical committees.

[History →](#)

[Advocacy →](#)

Mission & Vision

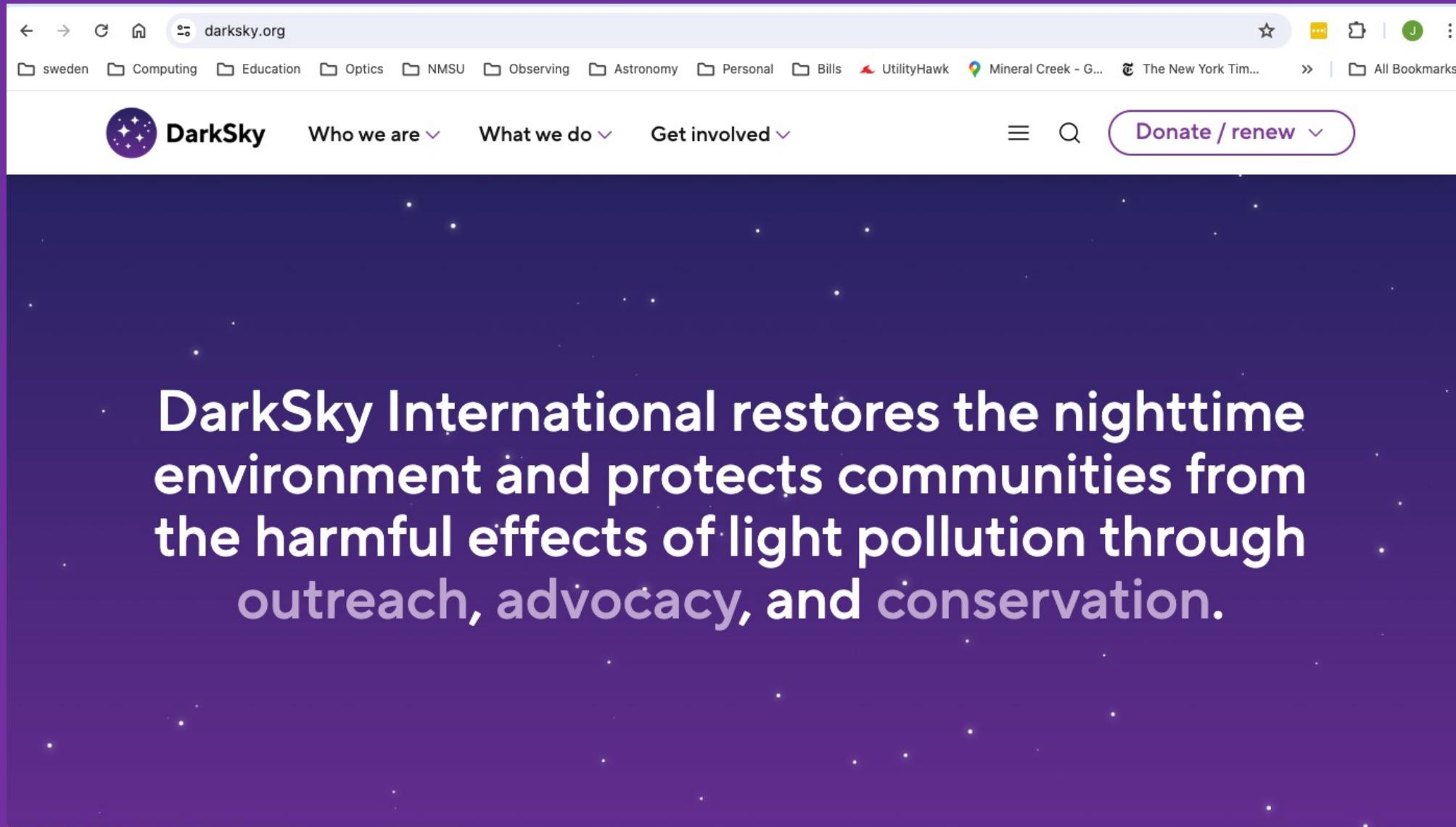
Mission Statement

The IES seeks to improve the lighted environment by bringing together those with lighting knowledge and by translating that knowledge into actions that benefit the public.

Vision Statement

The IES will build upon a century of excellence to create the premier lighting community dedicated to promoting the art and science of quality lighting to its members, allied professional organizations, and the public.

DarkSky International is a non-profit organization, based in Tucson, working worldwide to educate and effect change



Just last year, a New Mexico chapter of DarkSky International was formed, <http://nmdarksky.org>

Light pollution can be solved!

- Light pollution can be minimized and **still allow for responsible lighting**
- DarkSky International and the Illuminating Engineering Society have developed five basic principles of responsible outdoor lighting which, if followed, would go a long way towards improving and preserving our dark skies

Five Lighting Principles for Responsible Outdoor Lighting



DarkSky



Illuminating
ENGINEERING SOCIETY

Responsible outdoor lighting is

1 Useful

Use light only if it is needed

All light should have a clear purpose. Consider how the use of light will impact the area, including wildlife and their habitats.



2 Targeted

Direct light so it falls only where it is needed

Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.



3 Low Level

Light should be no brighter than necessary

Use the lowest light level required. Be mindful of surface conditions, as some surfaces may reflect more light into the night sky than intended.



4 Controlled

Use light only when it is needed

Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.



5 Warm-colored

Use warmer color lights where possible

Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.



worse

bad

good

better

Non-cutoff

Semi-cutoff

Cutoff

Full-Cutoff²⁶

Bill Wren/McDonald Observatory

Fixtures and their proper usage are critical!

BAD

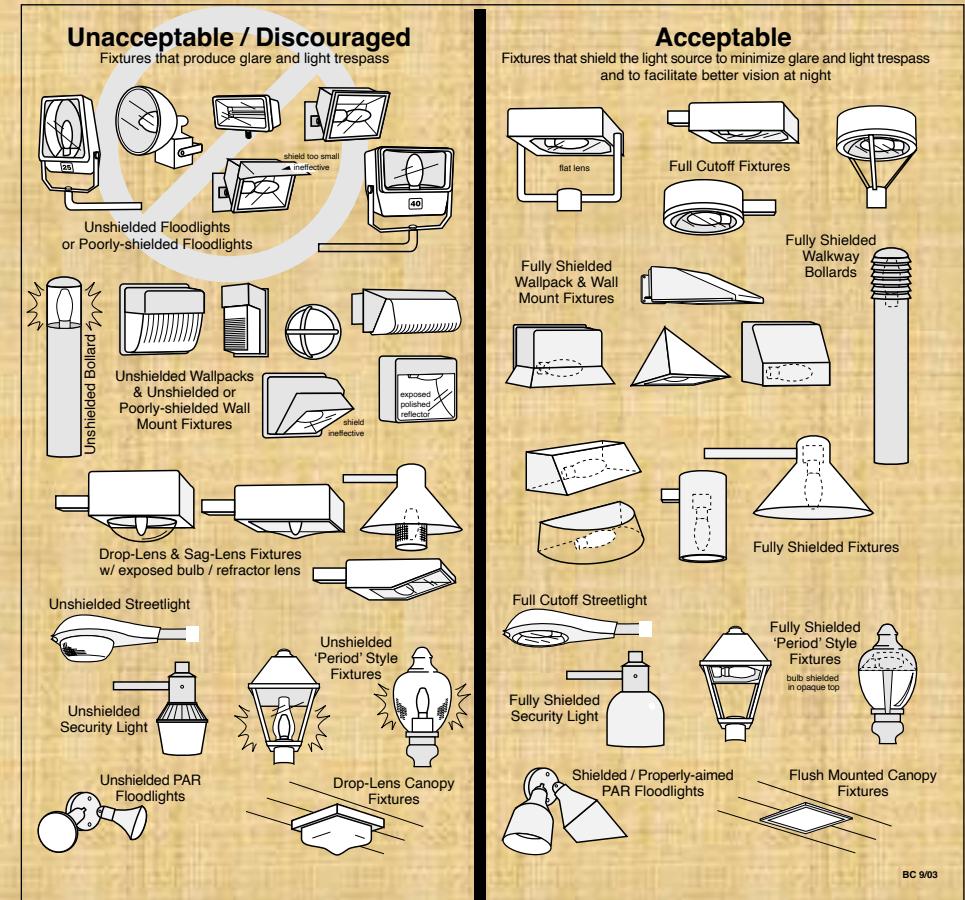


GOOD



BETTER LIGHTS FOR BETTER NIGHTS

Help eliminate light pollution. Select the best fixture for your application using this guide. Use the lowest wattage bulb appropriate for the task and turn off the light when it's not being used.



presented by the
DARK SKY SOCIETY
www.darksksociety.org

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DarkSky Approved products

Use this :

The screenshot shows the DarkSky website's "What we do" section. At the top, there are navigation links: "Who we are", "What we do", and "Get involved". On the right, there is a "Donate / renew" button. Below the navigation, the title "DarkSky Approved" is prominently displayed in large, bold letters. A subtitle explains the program: "The DarkSky Approved program provides objective, third-party certification for products, designs, and completed projects that minimize glare, reduce light trespass, and don't pollute the night sky." Below this text is a photograph of a modern house at night, illuminated from within and with low-glare exterior lighting. At the bottom of the page is a purple button labeled "Search products & companies".

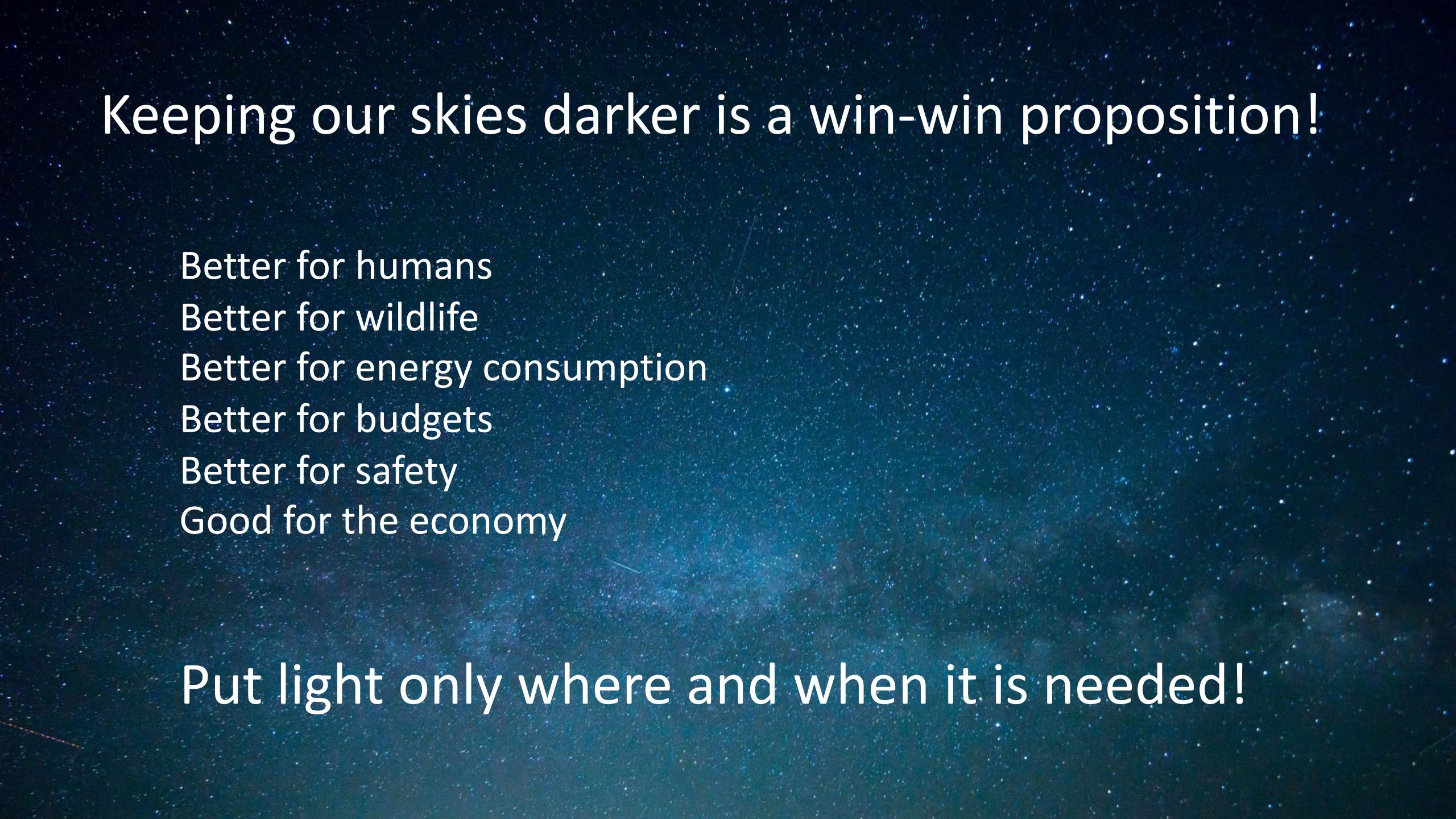


<https://darksky.org/what-we-do/darksky-approved/>

Not this!



Request quality and compliant fixtures from your retailers!
Tell them you don't want to pollute and trespass!



Keeping our skies darker is a win-win proposition!

Better for humans

Better for wildlife

Better for energy consumption

Better for budgets

Better for safety

Good for the economy

Put light only where and when it is needed!

What can we do?

- Discuss, educate and communicate!
- Follow good lighting practices at your homes
 - Use DarkSky approved products
 - Request retailers to carry and advertise them
 - Talk with your neighbors: concepts of glare and light trespass may be useful
- New Mexico has a Night Sky Protection Act, established 1999, but it has not been especially effective
 - Efforts are underway to try to improve it, we will need input to legislators
- Municipalities have lighting ordinances
 - Enforcement is typically a significant problem
 - Talk with municipal staff, legislators etc
- Help to raise awareness, and communicate that you care
 - Voluntary compliance may be the most likely path towards success

What can we do?

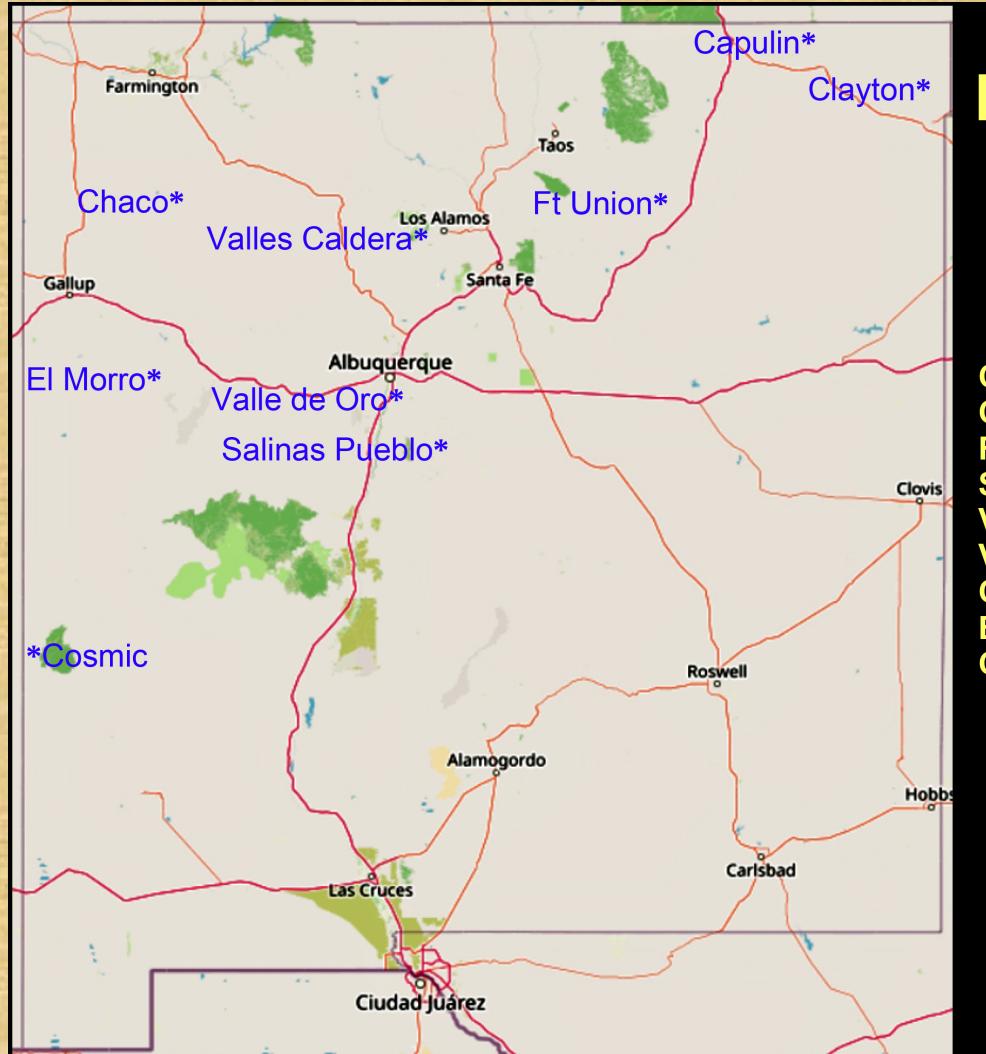
- Join DarkSky International (from \$35/year), and you will be a member of the state chapter!
<http://nmdarksky.org>
- Stay tuned for information about DarkSky events
 - Lights out for migration?
- Visit DarkSky places and encourage others to do the same
 - Enjoy the night sky!
 - Raises awareness
 - New Mexico True : <https://www.newmexico.org/darks skies/>



Formally designated DarkSky places

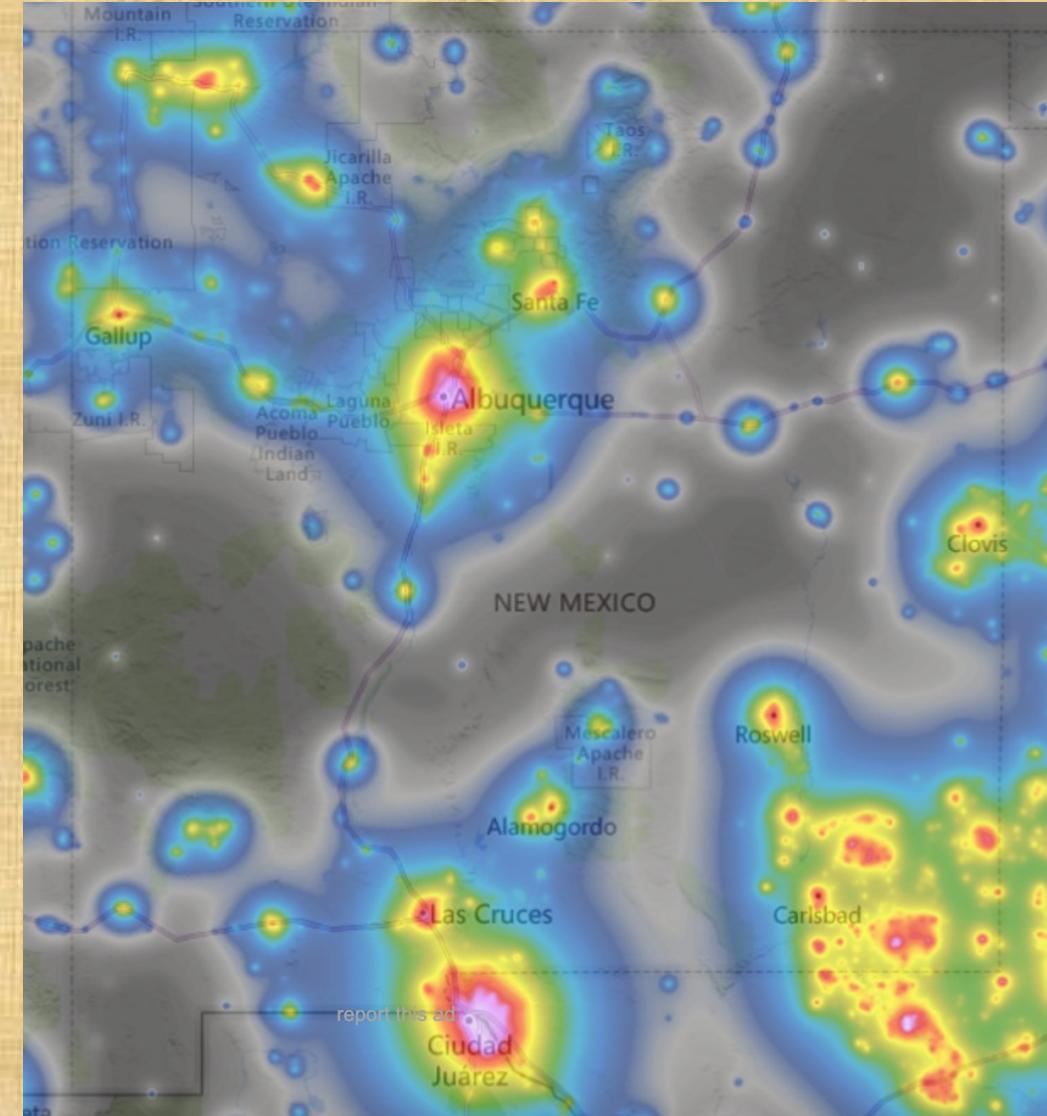
- DarkSky Sanctuary : public or private land that has an exceptional or distinguished quality of starry nights and a nocturnal environment that is protected for its scientific, natural, or educational value, its cultural heritage, and/or public enjoyment.
- DarkSky Park: land possessing an exceptional or distinguished quality of starry nights and a nocturnal environment that is specifically protected for its scientific, natural, or educational value, its cultural heritage, and/or public enjoyment.
- DarkSky Reserve: public or private land possessing an exceptional or distinguished quality of starry nights and nocturnal environment that is specifically protected for its scientific, natural, or educational value, its cultural heritage, and/or public enjoyment.
- DarkSky Community: a town, city, municipality, or other legally organized community that has shown exceptional dedication to the preservation of the night sky through the implementation and enforcement of a quality outdoor lighting ordinance, dark sky education, and citizen support of dark skies.
- Urban Night Sky Place: a municipal park, open space, observing site, or other similar property near or surrounded by large urban environs, and whose planning and design actively promote an authentic nighttime experience in the midst of significant artificial light.

Official DarkSky locations in New Mexico



New Mexico's Dark Skies

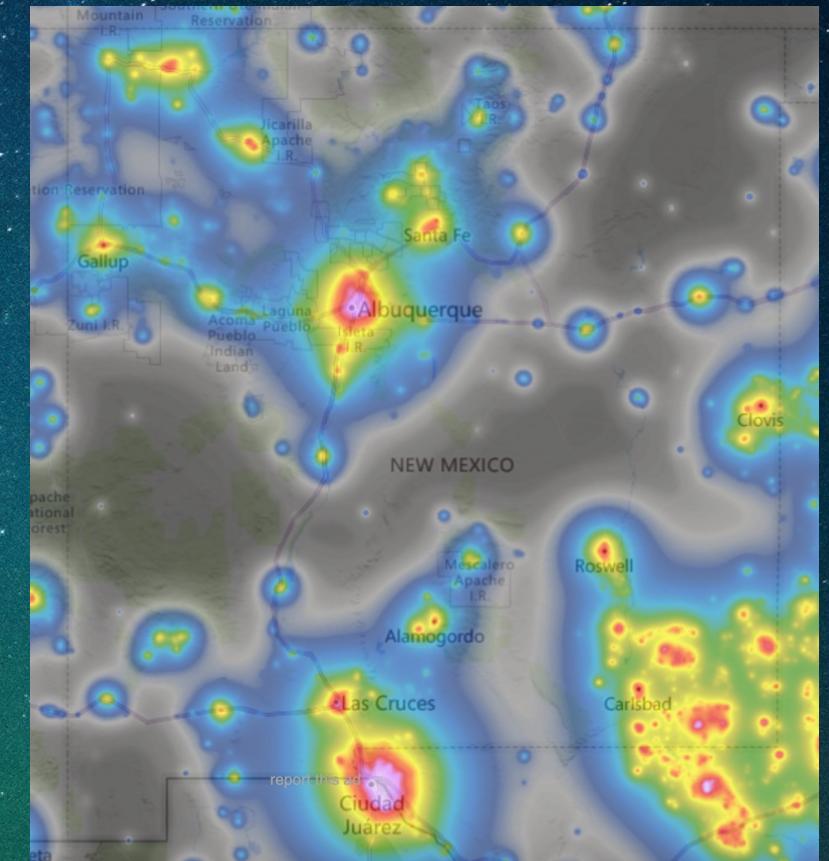
Clayton Lake State Park
Capulin Volcano NM
Fort Union NM
Salinas Pueblo NM
Valle de Oro NWR
Valles Caldera NP
Chaco Culture NHP
El Morro NM
Cosmic Campground



But light pollution is growing around the state....

Opportunities for more DarkSky places in NM

- State parks
 - City of Rocks
 - Bluewater Lake
 - Leasburg
 - Oliver Lee
 - Bottomless lakes
- Wilderness areas
 - Gila
 - Aldo Leopold
- Dark corridors
 - Highway 60 corridor
 - Animas/Rodeo/Peloncillos
- How about a Gila / SW NM DarkSky Reserve?



DarkSky Reserves



International Dark Sky Reserves

- A combination of public or private lands of substantial size (at least 700 square kilometers, or about 173,000 acres) possessing an exceptional or distinguished quality of starry nights and nocturnal environment, and which is specifically protected for its scientific, natural, or educational value, its cultural heritage, and/or public enjoyment. The Reserve is formed through a partnership of landowners and/or administrators that recognize the value of the natural nighttime environment through regulations, formal agreements, and long-term planning.
- The Reserve consists of two regions:
 1. A “core” area meeting the minimum criteria for sky quality and natural darkness
 2. A “peripheral” or “buffer” area that supports dark sky values in the core and receives similar benefits
- Those entities interested in applying as a Reserve must identify the core and periphery areas in their inquiry, and must provide detailed maps showing the boundaries of these proposed areas. Inquiries that need additional guidance in selecting these areas and partners are encouraged to reach out to DarkSky Program staff with some preliminary suggestions as to where and how they want to build the Reserve.

Dark Skies in New Mexico

A photograph of a dark night sky filled with stars. A bright, multi-colored nebula or galaxy is visible in the center. In the foreground, the silhouette of a person stands on a dark rock, looking up at the stars.

Join the movement and help save the night!

DarkSky Reserves



Eligibility criteria — Core

- **Management** — May be publicly or privately owned, but the applicant must demonstrate how the site is legally protected.
- **Nighttime public access** — The core must provide the opportunity for public nighttime access, with or without supervision. A portion of designated land may meet this requirement, or access may be available for a fraction of the length of the night.
- **Night sky quality** — Cores are, by their nature, situated in proximity to gateway communities, which may impact areas of the core's night sky quality. To meet DarkSky's definition of *dark* skies, the core must demonstrate that the Milky Way is visible on a typical night. These conditions correspond approximately to a visual-band zenith luminance of 21.2 magnitudes per square arcsecond or greater and a naked eye limiting magnitude (NELM) of +6.
- **Location** — The core zone boundaries must be drawn according to, and consistent with, the following principles:
 1. A core area does not have a minimum area requirement but must provide sufficient area to meet the outreach and public access requirements described in the Guidelines.
 2. The proposed core area boundary may take any shape and may follow logical or natural geographic features.
 3. The core need not be a single, contiguous piece of land; up to three cores may be defined, but this approach must be justified in the application document.
 4. If the core includes a publicly protected area, such as a national or regional park, it must strive to fully encompass the boundaries of that area.
- **Resources** — The core must be able and willing to commit to regular outreach efforts, external communications to educate both visitors and periphery communities about dark skies and light pollution, and meeting the 67%, 90%, and 100% lighting compliance rate timeline. It is strongly recommended for the Reserve to build a steering committee of key partners to organize efforts at the landscape scale.

DarkSky Reserves



Eligibility criteria — Periphery

- **Management** — At least 80% of the total population *and* 80% of the land area within the proposed peripheral area must participate in the Reserve efforts. This includes communities; regional governmental areas such as counties, districts, and municipalities; and publicly and privately owned managed areas. Participation includes adopting a quality comprehensive Lighting Management Plan or Policy (LMP) that applies to all private and public landowners within the area of protection.
- **Nighttime public access** — The emphasis for public access is focused on the *dark core* area, but other areas throughout the Reserve are welcome to encourage nighttime viewing experiences.
- **Night sky quality** — There are no night sky requirements for the periphery. However, the Reserve should plan on monitoring night sky quality throughout the periphery to assess changes in this resource, especially with community participation to further protect the core area with its lighting choices.
- **Location** — The peripheral zone boundaries must be drawn according to, and consistent with, the following principles:
 1. The proposed peripheral zone boundary must be singular and contiguous, and must completely enclose the core zone. It may take any shape and may follow logical or natural geographic features.
 2. The peripheral area (including the core) must encompass a minimum of 700 square kilometers (270 square miles or 173,000 acres), roughly equivalent to a circle of 15-km (9.3-mi) radius, *or* a land area sufficient to mitigate 80% of current and expected future light pollution threats to the core.
 3. Large areas of open water, such as oceans, bays, and larger lakes, do not count toward the 700-square-kilometer / 80% requirement.
 4. The boundaries of neither core nor periphery must be arbitrarily drawn to omit areas that would increase the difficulty of achieving the Reserve status, but must instead embrace these areas as an opportunity for improvement.
- **Resources** — Participating communities must have a program, through education, economic incentives, permitting, or regulation, to encourage all new outdoor lighting fixtures to conform to the relevant regulation or guidelines for night sky friendly lighting.
- Communities must have a number of examples of conforming lighting installations proportional to the size of the population they serve, both on roadways *and* on different private sites.