

TECHNICAL NOTES

Night Sky Protection Design Guidance for Outdoor Lighting Systems

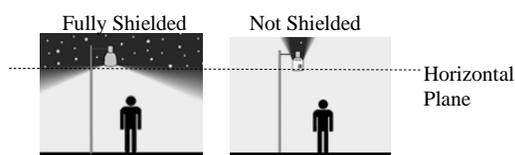
To provide guidance for planning outdoor lighting systems that preserve the ambiance of the night sky by reducing light pollution. This Technical Note provides planning guidance on NRCS Conservation Practice Standard, Lighting System Improvement (code 670) but may be used for other conservation planning purposes.

GUIDANCE

1. Fully shield exterior lights

Lighting should be designed and installed to be fully shielded; so lights shine down, not up or out (i.e. no light above the horizontal plane at the bottom of the fixture). Figure 1 provides examples of shielded fixtures.

- Lights 1,750 lumens or less may be exempt.



2. Use the minimum illumination adequate for the intended purpose

3. Use low color temperature bulbs

Choose bulbs with color temperatures less than 4,000 Kelvins (i.e. warm/soft white). Their light is less harmful to human health and the environment.

- If lighting is necessary near sensitive wildlife areas, use red filters (i.e. low wavelength).



4. Use lights only when they are needed

Install timers (lights off by 11pm), dimmer switches and turn lights off when not in use.

In addition to the general guidance provided within this technical note, ensure that all state or local lighting codes are followed.

Colorado Lighting Codes

Currently, Colorado is one of eleven states with night sky protection laws ([Title 24, Article 82, Part 9 \(24-82-902\)](#)). Please note that this law only pertains to light fixtures installed by or on behalf of the State.

However, several Counties and Cities have additional lighting codes:

- | | |
|-------------------|-------------|
| ▪ Adams County | ▪ Grand |
| ▪ Arapahoe County | ▪ Jefferson |
| ▪ Boulder County | ▪ Larimer |
| ▪ Boulder County | ▪ Mesa |
| ▪ Clear Creek | ▪ Morgan |
| ▪ Douglas | ▪ Pitkin |
| ▪ Eagle | ▪ Pueblo |
| ▪ El Paso | ▪ Summit |
| ▪ Fremont | ▪ Teller |
| ▪ Gilpin | ▪ Weld |

The Illuminating Engineering Society of North America provides online access to these codes at: <http://iesrmsdenver.org/code/lighting-codes/>



Defining Light Pollution

Light pollution is generally defined as misdirected, unshielded, excessive, or unnecessary night lighting.

Common forms of light pollution include:

Sky-glow the brightening of the night sky over inhabited areas such as towns and cities.

Glare creates deep shadows and can interfere with human vision.

Light Trespass light falling where it is not intended, wanted, or needed.

Light Clutter bright, confusing, and excessive groupings of light sources, commonly found in over-lit urban areas.

Effects of Light Pollution

There are generally five major areas affected by light pollution: wildlife, energy, safety, cultural and human health.

- *Wildlife.* Excessive lighting can affect the nighttime foraging, mating, and migratory behaviors of nocturnal wildlife. Refer to the brochure on [Light Pollution and Wildlife](#) (IDA, 2008).
- *Energy.* Fixtures that allow light to escape upward or provide more light than is required are major contributors to energy inefficiency. Refer to the brochure on [Light Pollution and Energy](#) (IDA, 2008).
- *Safety.* Too much lighting can threaten security by compromising vision with glare and casting harsh shadows. Refer to the brochure on [Light Pollution and Safety](#) (IDA, 2008).
- *Cultural.* The value of dark skies is being compromised by light pollution, specifically by sky-glow. Today, many stars including the milky way are no longer visible.
- *Human Health.* Exposure to excessive artificial light at night can disrupt the circadian rhythm and deregulate biological functions. Refer to the brochure on [Light Pollution and Human Health](#) (IDA, 2009).

References

- IDA, 2008. Light Pollution and Energy. International Dark-Sky Association. Tucson, AZ. www.darksky.org
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- NASA, 2012. “Night Lights” Imagery of the Earth. <http://www.blue-marble.de/nightlights/2012>

Figure 1 - Examples of Fully Shielded Fixtures

