

3.5 LIGHTING

Introduction

Light pollution has been shown to pose significant consequences for human health. Artificial light at night disrupts circadian rhythms, suppresses melatonin production, and has been linked to an increased risk of sleep disorders, metabolic diseases, and even certain cancers. Studies have shown that excessive exposure to artificial light can contribute to cardiovascular disease, obesity, and mental health disturbances by interfering with natural sleep-wake cycles. Communities with high levels of light pollution experience greater rates of sleep deprivation, which in turn affects cognitive function, productivity, and overall well-being. It also obscures the starry sky and impairs nighttime views.

A substantial and growing body of research has demonstrated that artificial lighting is also strongly correlated with bird fatalities and the disruption of critical migration patterns. Approximately 70% of North American bird species are migratory, with the vast majority traveling at night. Light pollution presents a significant barrier to their navigation, leading to disorientation, exhaustion, and fatal collisions. Artificial lights can pull birds off their migratory paths, causing them to collide with buildings and windows or forcing them to land from exhaustion. The loss of avian biodiversity threatens essential ecosystem functions, including pollination, seed dispersal, and pest control.

Artificial light has impacts beyond humans and birds. It can disrupt bat foraging patterns, lead to a decrease in insect pollinator species, impede amphibian communications, alter fish feeding and migration patterns, and cause problems for wildlife that depend on natural darkness for survival. For these reasons, we recommend implementing human- and animal-friendly lighting along the Jordan River Parkway, which runs through some of the densest human populations in Utah, as well as important wildlife habitats.

General Recommendations

Lighting should be focused on parking lots and at trailheads along the trail. Dark Sky-compliant lighting should be used. Bollard-style lighting may be used for trailhead lighting outside of parking lots. A helpful glossary with definitions, provided by the International Dark Sky Association, can be found [here](#).

Dark Sky-compliant lighting should:

- Only be on when needed
- Only light the area that needs it
- Be no brighter than necessary
- Minimizes blue light emissions
 - Low-temperature bulbs (CCT of 3,000 Kelvin or less) are recommended
- Utilizes fully shielded (pointing downward) light fixtures that are closer to the ground
- Minimize the amount of lighting during peak migration times (30 minutes to 4 hours after sunset) and during peak migration season (mid-March to mid-June and mid-August to late November)

- Some jurisdictions favor solar-powered lighting in natural areas to reduce wildlife disruptions from construction to install hard-wired light fixtures
 - Consider winter-time conditions that may impact operability or become covered with snow
- Motion sensor lights may be beneficial in balancing lighting solutions to reduce unnecessary lights being on in empty areas
 - Encourage the use of multi-level /adjustable brightness motion sensor lights in areas where continuous lighting is used or necessary to reduce or dim the lighting to the minimum level necessary

Dark Sky's Five Principles for Responsible Outdoor Lighting

Responsible outdoor lighting is

1 Useful

2 Targeted

3 Low Level

4 Controlled

5 Warm-colored

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.

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.

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.

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.

Use warmer color lights where possible

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

DarkSky

IES Illuminating Engineering Society

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Examples of Acceptable / Unacceptable Lighting Fixtures

Unacceptable / Discouraged
Fixtures that produce glare and light trespass

Unshielded Floodlights or Poorly-shielded Floodlights

Unshielded Wallpacks & Unshielded or Poorly-shielded Wall Mount Fixtures

Drop-Lens & Sag-Lens Fixtures w/ exposed bulb / refractor lens

Unshielded Bollards

Unshielded Streetlight

Unshielded Barn Light

Louvered 'Marine' style Fixtures

Unshielded 'Period' Style Fixtures

Drop-Lens Canopy Fixtures

Unshielded PAR Floodlights

Acceptable
Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night

Full Cutoff Fixtures

Fully Shielded Wallpack & Wall Mount Fixtures

Fully Shielded Fixtures

Full Cutoff Streetlight

Fully Shielded Barn Light

Fully Shielded Bollards

Fully Shielded Decorative Fixtures

Fully Shielded 'Period' Style Fixtures

Flush Mounted or Side Shielded Under Canopy Fixtures

Shielded / Properly-aimed PAR Floodlights

Shielded Lighting Example (4)

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Economic Benefits

Designing outdoor lighting with the night sky in mind isn't just about reducing light pollution — it's also a smart way to save money and energy. Here are some key facts and recommendations to highlight the benefits:

1. Lower Intensity Bulbs Have Lower Energy Costs
 - a. Using bulbs with lower lumen outputs (brightness) can cut electricity use dramatically. A 9-watt LED bulb, for example, uses 80–85% less energy than a traditional 60-watt incandescent, while still providing sufficient, targeted illumination for safety and usability.
2. Turn Off or Dim Lights Overnight
 - a. Leaving outdoor lights on all night wastes both light and money. Studies show that turning lights off during non-peak hours (or using dimmers) can reduce energy costs by 30–60%, depending on usage patterns.
3. Timers, Motion Sensors & Smart Controls
 - a. Automating your lights ensures they're only on when necessary. Motion-activated lighting can reduce outdoor light use by up to 70% compared to leaving lights on continuously. Timers and smart controllers can further cut down on waste by syncing lighting to your actual needs rather than leaving it to chance.
4. Added Savings
 - a. Less electricity usage results in lower monthly utility bills. Lower intensity lighting extends the lifespan of bulbs, reducing replacement costs. Reduced light use can lower your carbon footprint and minimize strain on power grids.

Example Ordinances

Please see the appendix for examples of specific ordinance recommendations. Below are links to some cities that have implemented human- and wildlife-friendly lighting solutions. Examples of effective lighting interventions:

- Draper, UT: [CHAPTER 20 OUTDOOR LIGHTING](#)
- Moab, UT: [Moab Dark Skies](#)
- Tucson, AZ: [Dark Skies | Visit Arizona](#)
- Denver, CO: Trail lighting guidelines by Clanton Associates- [Master Planning & Policy Projects](#)
- Tampa, FL: [Lighting](#)
- Louisville, CO: [w Louisville, CO Dark Sky Draft Ordinance_3.24.23 \(002\).docx](#)

- Tempe, AZ: [Lighting](#)
- Ireland: [Lighting](#)
- Joint IDA-IESNA Model Outdoor Lighting Ordinance: [Lighting](#)
- BLM Night and Dark Skies Environments Lighting Recommendations (2023) - [PDF document](#)

Additional Considerations

Safety

It may seem appealing to install additional lighting fixtures for safety purposes. This is appropriate in some situations, but increased lighting does not always correlate to increased safety. There are other options for improving safety that are more effective than lighting and can also prevent harm to wildlife. Crime Prevention Through Environmental Design (CPTED) is a multi-disciplinary approach to reduce crime and fear of crime. CPTED strategies aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants so they can gain territorial control of areas to reduce crime opportunities. You can review their resources below:

- About CPTED: <https://www.cpted.net/Primer-in-CPTED>
- Case Studies on Increasing Walking and Bicycling through Crime Prevention Through Environmental Design: [PDF document](#)

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Trail Intersections

- Use fully shielded fixtures that direct light downward to minimize skyglow.
- Ensure light does not spill beyond the trail area to prevent disturbing wildlife.
- Consider motion-activated lights that only turn on when needed, reducing unnecessary illumination.
- Use timers or dimming controls to lower brightness during off-peak hours.
- Employ pathway lights instead of high-mast poles, which can disperse light over a wider area.

- Keep fixtures at lower heights (≤ 12 feet) to focus light on the trail without unnecessary upward dispersion.
- Position lights at intersections only where necessary, avoiding overuse.
- Use non-reflective, matte surfaces for fixtures to reduce unintended glare.
- Avoid overly bright or glossy trail markers that could contribute to light pollution.
- Employ appropriate signage and/or warning signs.
- Continuous lighting may be preferable to discontinuous or flashing lighting, but there is limited research on the subject.

Bridges

- Avoid high-intensity lights that create a glare on wet surfaces, making it difficult for users to see.
- If using embedded lighting (e.g., bollards or rail-integrated lights), ensure the design reduces direct visibility of the light source.
- Mount fixtures on bridge railings, deck edges, or low bollards to keep light close to the surface and reduce overall glow.
- Avoid placing lights where they can reflect off water, which can disturb aquatic life.
- Use amber or red spectrum lighting near sensitive habitats to minimize disruption to nocturnal species.
- Conduct environmental impact assessments if the bridge is in or near a protected area.

Dense Development

- Opt for full cutoff designs that reduce light spill onto adjacent properties or the sky.
- Position lights strategically at key points, such as intersections, curves, or access points, rather than continuously along the trail.
- Use lower mounting heights (10–12 feet or less) to keep light focused on the path without excessive spread.
- Use backlight shields or house-side shields to prevent light from intruding into nearby homes or green spaces.
- Coordinate lighting plans with local governments, developers, and community stakeholders to align with urban design goals.
- Use aesthetically pleasing fixtures that complement the urban environment while maintaining dark sky compliance.

Natural Areas

- Use low-profile bollards or path lights instead of tall poles to keep illumination close to the trail.
- Consider low-glare, full-cutoff fixtures to reduce light spill into surrounding habitats.
- Use the lowest possible brightness (lumens) needed for visibility and safety.
- Motion sensors ensure lights activate only when people approach, reducing unnecessary illumination.

- Timers or dimming controls allow lights to be turned off or dimmed during late-night hours.
- In very sensitive areas, consider user-activated lighting, where trail users can turn lights on temporarily.
- Keep perimeter lights and lights that are visible through windows off during migration times.
- Place lights only at critical points like trailheads, intersections, bridges, or signage—avoid continuous lighting.
- Keep light poles lower (ideally 10 feet or less) to minimize skyglow and light spread.
- Avoid placing lights near water bodies (to prevent reflections that disturb aquatic life) or dense vegetation (to reduce habitat disruption).
- Shield lights away from nesting areas, wetlands, and migration corridors to protect nocturnal species.
- Use long-wavelength lighting (amber, red, or filtered LED) to reduce impact on insects, birds, and mammals.
- Conduct environmental impact assessments to determine the most wildlife-friendly lighting plan.
- Work with local conservation groups and land managers to balance safety with environmental protection.

Different Habitats

1. Forested Riparian Zones (River & Stream Corridors with Tree Cover)

- Challenges: Dense vegetation can amplify light scattering and disturb nocturnal animals (e.g., owls, bats, amphibians).
- Solutions:
 - Use low-height bollard lights (under the tree canopy) instead of overhead lighting.
 - Prefer selective lighting at intersections rather than continuous illumination.
 - Use long-wavelength amber or red lights to reduce disruption to forest-dwelling species.

2. Grassland Riparian Zones (Wetlands, Prairie Streams, Open Riverbanks)

- Challenges: Open landscapes allow light to travel further, potentially increasing skyglow.
- Solutions:
 - Use low-intensity, well-shielded lights with narrow beam angles to minimize spread.
 - Position lights away from reflective water surfaces to reduce glare.
 - Prefer motion-activated or time-restricted lighting to maintain dark periods.

3. Desert Riparian Zones (Oases, Seasonal Washes, Arid River Corridors)

- Challenges: Desert ecosystems rely on natural darkness for nocturnal species (e.g., reptiles, insects, and birds).

- Solutions:
 - Use minimal or no permanent lighting—favor reflective markers or solar-powered guide lights.
 - Choose red-spectrum or amber LEDs to avoid attracting insects and disturbing wildlife.
 - Avoid placing lights near water sources, as they are critical for nocturnal animal activity.

4. Urban-Adjacent Riparian Zones (Parks, Greenways, City Waterways)

- Challenges: Light pollution from nearby buildings and streets can already impact the riparian zone.
- Solutions:
 - Use shielded fixtures with house-side shields to prevent additional light pollution.
 - Implement adaptive dimming at night to balance safety with environmental concerns.
 - Coordinate lighting designs with municipal dark-sky policies and local conservation efforts.