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Dark Skies and Loudoun's Wildlife

We've all seen the effects of increasing light pollution across the county. Globally, light pollution is increasing rapidly—studies say roughly 10% more per year ([Barantine, 2023](#)). With continually increasing developed land, Loudoun is no different. From glare off new lit athletic fields to a change in the hue of the sky from seasonal holiday display uplighting; all the light that we observe impacts wildlife.

Light pollution is the inappropriate or excessive use of artificial light that negatively impacts natural and necessary dark skies. Issues that come along with light pollution include glare, light trespass, and skyglow. You can find a glossary of terms relating to lighting and light pollution [here](#). As a rapidly developing county, Loudoun is increasingly becoming susceptible to the dangers of increasing light pollution to our natural ecosystems.

Wildlife Impacts

All wildlife rely on dark nightscapes. This includes nocturnal (animals active at night), diurnal (animals active in daytime), and crepuscular (animals active during twilight) organisms across all taxa. Each rely on distinctive photoperiods and dark nightscapes for their breeding success and survival. The problems associated with artificial lighting are exacerbated when one considers just how inextricably linked all organisms in a given community are—what harms one species can lead to the instability or collapse of an entire ecosystem.

Insects

Insects are a foundation in many ecosystems, serving as a fundamental food source at the bottom of the food web and serving as essential pollinators. Most are familiar with the concept of bugs being attracted to light. Additional lights introduced into their natural nocturnal environment can be detrimental to insect populations. Artificial light affects essentially every aspect of their survival and functionality, including vision, flight, hearing, camouflage, circadian rhythms, migration, and ability to evade predation ([Frank, 2006](#)).

Light pollution is unique in that it is an anthropogenic disturbance that has no natural analog (as opposed to global temperature change, range shifts, etc.). The light element of the diurnal cycle is one that has remained constant throughout evolutionary time. As r-selected species (large brood size and short lifespan), insects are susceptible to evolutionary changes at a faster rate than other species. Estimates from some studies have shown that as many as one-third of the insects attracted to a stationary light source at night will die before the morning ([Owens et al., 2020](#)). This drastic and unprecedented artificial selection has the potential for repercussions that could severely impact food webs and

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ecosystem structures—already studies are showing that insect declines are drastic. See [here](#) for a compilation of research showing details on the effects of artificial nighttime light on insects.

Amphibians

Unique amphibians reside in the many wetlands that make up significant portions of Loudoun County’s greenspaces and open space. Amphibians are usually nocturnally active and notoriously sensitive to habitat changes that can alter their reproduction and behavior. Amphibians are uniquely impacted by nighttime light; while studies haven’t found a direct correlation with increased mortality, indirect impacts can be detrimental to their survival and livelihood. Especially notable to amphibians specifically are uniquely dangerous morphological and physiological impacts. Multiple studies have shown that exposure to excessive light at night inhibits the production of hormones that trigger metamorphosis in amphibians. In one study, tadpoles exposed to light at night were shown to develop at a considerably slower rate than those that are under dark skies. This delay in metamorphosis makes tadpoles more susceptible to predation and could result in total population loss if eggs are laid in temporary water sources such as vernal pools that dry before frogs or salamanders are matured enough to leave the water ([Wise, 2007](#)).

Nocturnal Mammals and Marsupials

Most nocturnal animals use only rod cells to see. Rod cells are photoreceptors specialized for optimizing scattered light and revealing high-definition detail in darkness ([Shen, 2012](#)). Bright artificial light, including that emitted from popular LEDs, saturates their retinas and causes temporary blindness, leaving them susceptible to predation and accidental trauma leading to fatalities—take the ‘deer in the headlights’ phenomenon as an example ([National Institute of Environmental Health Sciences, 2015](#)).

Additionally, the prey species for some nocturnal mammals and marsupials such as bats and opossums, are those which are dangerously attracted to artificial light. These light sources act as ‘traps’ for these predators to catch their prey, which can create population imbalances as increased predation decreases population size and subsequent prey availability. This phenomenon is also known as the vacuum effect, and makes these predators even more susceptible to the dangers of artificial nighttime light as well as proximity to humans.

Birds

Birds are arguably the most heavily impacted by excessive lighting that impacts dark skies in Loudoun County. Artificial nighttime lights pose a significant threat to migrating birds. Birds typically migrate at night, navigating by the moon and stars ([National Audubon Society](#)). These flocks therefore can become easily distracted and disoriented by lights of any kind. This leads to flocks getting thrown off-course, and often inadvertently drawn to cities emitting large degrees of light—an extremely

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dangerous environment. Millions of birds die each year from collisions with buildings in heavily-lit places, as well as with homes and communication and industrial towers that are lit with steady-burning lights. Birds are particularly attracted to steady-burning light that is white or red in hue, especially at higher altitude, such as those on cell and communication towers. Flashing lights, on the other hand, help ameliorate this, decreasing collision fatalities by 50-70%.

Uplighting

Studies conducted by the United States Fish and Wildlife Service and other entities have found unshielded upward facing lighting has significant impacts to nocturnal wildlife, especially birds. In addition to the distraction and disorientation caused by all kinds of nighttime lighting, this practice, known as uplighting, is particularly dangerous to birds. It poses the unique risk of birds seeing the light from above and becoming fixated on it. This leads to birds becoming so disoriented that they will fly in circles around the lights for extended periods of time. Not only does this pose the immediate risk of birds dropping from exhaustion, it also poses a significant longer-term health issue to flocks in that it can prevent birds from keeping the necessary energy stores to complete migration, leading to die off in colder and unsuitable climates.

All Other Animals

Wildlife across the globe and throughout biomes and habitat types are impacted by artificial nighttime lighting. The effects of lightening skies are extensive, impacting animals in Loudoun County and beyond. Sea turtle hatchlings rely on following the moon to safely cross beaches from their nests in sand dunes, and expose themselves to predation when they mistake artificial light for the moon, never making it to the ocean and contributing to the already pervasive species decline. This is just one of many examples of the far-reaching effects of light pollution on wildlife.

DarkSky International

Loudoun Wildlife Conservancy supports adhering to dark sky standards set by Dark Sky International (DarkSky), the organization previously known as the International Dark Skies Association (IDA). In general, DarkSky states that outdoor lighting should only be used when and where it's needed, be no brighter than absolutely necessary, avoid all upward-facing light, and minimize blue light emissions (Dark Sky International).

DarkSky encourages [Values-Centered Outdoor Lighting](#) in order to allow for flexibility in lighting installation, design, and operation. Major sources of light pollution such as parking lots, street lights, and buildings should adhere to this approach to minimize impact on dark skies. This approach is summarized in DarkSky's Five Principles for Responsible Outdoor Lighting—a collaboration between

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the IDA and lighting professionals at the Illuminating Engineering Society. The five principles are as follows:

1. Useful: Outdoor lighting is implemented only when there is a clear and necessary purpose
2. Targeted: Lighting is shielded and carefully aimed to ensure that it shines only in the precise location it is needed
3. Low-Level: Lights are kept at the lowest brightness level required
4. Controlled: Lights are able to be turned off or dimmed when not needed
5. High wavelength: Lights avoid low wavelength or “cool” colors

Find more details on the five principles [here](#). DarkSky also has standards specific to certain types of lighting, including those which pose the greatest risks to wildlife in Loudoun County. You can find a guide for dark-sky-friendly residential and business lighting [here](#). DarkSky recognizes also that the demand and necessity for the installation of outdoor sports lighting has increased, a fact that we in Loudoun County are very familiar with. DarkSky acknowledges that the type of lighting required to light ballfields and outdoor sports areas create more light pollution and environmental impacts than do standard lighting needs ([Dark Sky International, 2023](#)). This led them to implementing the Community-Friendly Sports Lighting Design Certification, which has [technical criteria](#) to determine if outdoor sports lighting practices are dark-sky compliant.

While these standards, especially those relating to dark-sky friendly outdoor sports lighting, are an excellent resource, the ultimate aim should be to focus on using as little light as possible at all times. In order to protect dark skies and the wildlife that rely on them, minimized light use must be in place. Allowing for drastic increases in light pole height, uplighting, and foot candle allowance into rural areas, open space, and wetlands runs counter to the aim of minimizing light pollution.

Prevent Increasing Light Pollution

In response to each new development effort to meet Loudoun’s wants and needs, standards to protect wildlife and preserve our unique environmental resources must be reinforced and put in place. Our wildlife suffer most extensively from disrupted nightscapes, but all Loudoun county residents are impacted. Dark skies are a scenic resource to our communities that shouldn’t be understated, especially when one considers Loudoun’s proximity to Sky Meadows State Park—a park officially designated as an international dark skies park.

Excessive nighttime artificial light is a nuisance to those residing near excessively lit places, as many people in Loudoun County are familiar with, but overexposure to artificial light at night can

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[negatively affect human health](#) as well as wildlife stability. In order to curb light pollution, restrictive lighting standards must be applied across the county, year-round, to street lamps, homes, parks, businesses, government buildings, schools, data centers, and athletic fields. Efforts to reduce light pollution fall largely on county policy and enforcement, but private citizens can take action to minimize the use of artificial nighttime light as well.

Lighting standards must be more thoughtful and constrained in order to protect important wildlife corridors and natural areas. We can all do our part to minimize skyglow in the county for the sake of the wildlife that depend on our dark skies. Ensuring that lights on your property are used to the least degree possible and speaking up on development proposals for excessive lighting go a long way to protecting ourselves, our environment, and the creatures that need darkness we often take for granted.

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