

## Light Pollution and Animal Behaviour

Although many people are familiar with the activity of the natural world during the day (i.e., photobiology), few people are as familiar with similar activity at night. Humans are not the only species whose biological clock is controlled by day-night contrasts and the release of melatonin. It is found in plants and animals wherein it plays a similar role<sup>1</sup>. Wildlife depends on the darkness of the night and the study of this dependence is called “scotobiology”.

Research into the nocturnal environment is relatively recent compared to research into the daytime environment. Consequently there is far less published literature documenting the sensitivity of the general nighttime ecology to artificial lighting. Most of the research is on specific species in the wild or laboratory studies. However, mounting scientific evidence is documenting the profound impact of artificial light on the ecology of the night.

Plants are affected by the colour and duration of lighting. Whether the effects are considered beneficial or not depends on the desired outcome. Generally, artificial lighting will change the natural growth patterns and may affect the resistance of plants to infestations and disease. Many plants respond to the length of the night and normally recognize it as an indication of the season. By extending light past the evening, may slow the plant’s biochemistry from changing to prepare for winter<sup>2</sup>. The various affects of colour, duration, type of plant, etc. makes sweeping conclusions impossible however, they indicate that changing the lighting environment will alter the natural ecology of the area.

Artificial sky glow extends well beyond the city boundaries. Therefore in considering urban outdoor lighting, we must also consider its impact on rural areas in the region.

Exposure to short periods of bright illumination (less than a minute) does not seem to affect the biological rhythm in animals<sup>3</sup>. However, longer exposures to light can shift (or entrain) their circadian rhythm and modify their behavioural patterns. Minimizing the duration of exposure to artificial light is necessary to limit its impact.

Seasonal variations will shift the time of sunset by over four hours (from roughly 16:30 in winter to 21:00 in summer – in mid latitudes). During the peak of Park activities in summer, the time of sunset can vary by two hours. In addition to this, dusk can extend the daylight by as much as an hour. Although no references were found in the published literature that documents how wildlife accommodates for this variation, their behaviour has presumably adapted to it.

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<sup>1</sup> “Lighting for the Human Circadian Clock”, S. M. Pauley, *Medical Hypotheses* (2004) 63,588–596

<sup>2</sup> *Ecological Consequences of Artificial Night Lighting*, C. Rich, T. Longcore, Island Press, 2006, Pg. 405

<sup>3</sup> *Ecological Consequences of Artificial Night Lighting*, C. Rich, T. Longcore, Island Press, 2006, Pg. 24

Artificial lighting changes the nighttime behaviour of various species<sup>4</sup>. Over a month, the changing phases of the Moon affect the ground illumination at night. Nocturnal mammals adapt their behaviour over the month in sympathy to moonlight to avoid predators. This behaviour includes, in part, limiting the foraging area and carrying food back to their shelters instead of eating it in the field. This latter adaptation limits how much they can eat<sup>5</sup>. They compensate for this during the dark time of the month.

Predator and prey behaviour depends on the darkness of the night<sup>6</sup>. Illumination levels that significantly affect wildlife are believed to be at the level of the full Moon, although the effect begins to be evident at lower light levels<sup>7</sup>. To put this in context, it is generally recommended by the IESNA that an urban parking lot be lighted to more than 100X this level.

It is well documented that some insects are drawn towards light sources. This interrupts their normal mating and foraging activities and it concentrates them within a small area thus enhancing predation<sup>8</sup>. They may swarm the light fixture until they fall to the ground exhausted. The resulting pile of insects must then be cleaned up.

Animals separated from their normal foraging grounds by an illuminated road cannot see the area beyond the lights. Even the occasional passing car can temporarily blind them with headlights. Their natural instinct is to wait until they can see where they are going. This can leave them in the open and vulnerable to predation. They may cause them to abandon their established foraging patterns for new ones, which will impact other species as they compete for resources<sup>9</sup>.

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<sup>4</sup> The Urban Wildlands Group ([www.urbanwildlands.org/abstracts.html](http://www.urbanwildlands.org/abstracts.html))

<sup>5</sup> Ecological Consequences of Artificial Night Lighting, C. Rich, T. Longcore, Island Press, 2006, Pg. 28

<sup>6</sup> *ibid.*, Chapter 2

<sup>7</sup> *ibid.*, Chapter 11

<sup>8</sup> *ibid.*, Chapter 13

<sup>9</sup> Ecological Consequences of Artificial Night Lighting, C. Rich, T. Longcore, Island Press, 2006