

ECOLOGY

The Dark Side of Night Lighting

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The aura of light that hangs over a city on an otherwise dark night brings into sharp focus the impact *Homo sapiens* is having on Earth. A satellite view of the planet at night reveals swathes and pimples of light, clearly identifying hot spots of human activity—Europe, the United States, India, and Japan. The light is a sign of our species extending its influence, packing action into every hour of the day and night.

Ecological Consequences of Artificial Night Lighting
Catherine Rich and Travis Longcore, Eds.

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“Artificial night lighting” seems a rather passive description for something that, as we can easily perceive, has such a pervasive effect on our fellow species. Based on expert reviews of the responses of a wide range of organisms, *Ecological Consequences of Artificial Night Lighting* offers a unique insight into how these effects manifest themselves. The volume’s six sections cover mammals, birds, reptiles and amphibians, fishes, invertebrates, and plants. Each begins with a vignette on ecology at night, either excerpted from earlier accounts (e.g., writings by Alexander von Humboldt and Henry David Thoreau) or experiences described for the book (e.g., short essays by Bernd Heinrich and Carl Safina). The editors, Catherine Rich and Travis Longcore (who run the Urban Wildlands Group, a nonprofit conservation organization in Los Angeles), have a passion for the aesthetic qualities of night skies free from photopollution. For my part, I share their enthusiasm for a world in which humans have a much smaller ecological footprint. But the reality is that our constant drive for development, wealth creation, and all the associated ancillary insanities of consumption results in less wilderness, less wildlife, and less peace.

Rich’s love of “empty” space—which, of course, from a wildlife perspective is the antithesis of empty—where species have adapted to nocturnal life strategies shines through in her preface. In their introduction, she and Longcore cite calculations that 44% of Americans live in locations where it does not become sufficiently dark for the human eye to complete the transition from cone to rod vision (1). The diurnal and noc-

turnal components of the 24-hour cycle are now blurred across large parts of the globe (almost entirely in developed countries) because of our “need” for light. The editors note that nearly 19% of Earth’s terrestrial surface “experiences night sky brightness that is polluted by astronomical standards.” What effect are these undark skies having on the wildlife and the ecosystem functions and services on which we depend? Providing the best examination to date of this question, the book synthesizes current thinking on a topic of considerable, if often unrecognized, importance to conservation professionals. Nearly all environmental impact assessments should include an analysis of the effects of lighting, both specific to the development of a particular site and cumulative, but very few do. Our own diurnal perspective on life blinds us, and so we forget the vast number of species that rely on darkness—to hide, to catch prey, to mate, to interact.

The book provides the scientific foundation for understanding the impacts of night lighting and then acting on research findings to reduce or, better still, avoid its damaging effects on wildlife. Although the first review of the mechanisms by which animals are attracted to lights appeared in 1958 (2) and its author coined the term “photopollution” in 1985 (3), only within the last decade has there been much research on the ecological consequences. Bearing in mind that (as noted in the book) humans have long influenced animal behavior with light (for example, the use of campfires to keep predators at bay), the dramatic increase in electrical lighting in the past 40 years is a relatively rapid change for wildlife to accommodate.

For such a new area of research, the work is fairly thorough, and the book provides many useful pointers for management. For example, road lighting may not deter vehicle collisions with mammals, and may even exacerbate the problem, because many nocturnal mammals use only the rod system for sight and bright lighting saturates their retinas. In contrast, some species of bats seem to benefit from street lighting, as they preferentially feed on insects attracted to lights, although these favored bats may in turn displace other insectivorous species that do not forage at lights through interspecific competition. Jens Rydell concludes that the replacement of mercury vapor lamps with high-pressure sodium vapor lamps (which attract fewer insects) benefits both bats and insects.

Sidney Gauthreaux and Carroll Belser’s consideration of the effects of lighting on migrating birds makes particularly pertinent reading. They find that the increasing use of artificial lighting is having an adverse effect on bird populations, especially on species that typically migrate at night. Mass mortalities of birds attracted to lights were noted at lighthouses and lightships in the mid-1800s, but the relatively recent expansion of cities, the escalating height of lit buildings, and the ongoing spread of communications towers across the land are having an increasingly damaging impact on birds. Aircraft warning lights placed on such towers lead to the deaths of hundreds of thousands of nocturnal migrants each year. Most mortality occurs on nights when the moon is new or only slightly illuminated. The authors describe practical measures—such as replacing red lights, which disorientate birds, with white—with the potential for substantially reducing such losses of migrating birds.

Sea turtles are another taxon for which the



R. N. Cohen’s *Wolf Moon* (detail).

effects of artificial lighting are comparatively well studied. Michael Salmon’s review of research in Florida suggests the benefits of using embedded road lights (rather than poled streetlights) and replacing traditional coastal lighting, which attracts and tragically disorients turtle hatchlings. The message is clear—keep the nesting beaches dark at night.

Through their examples and discussions, the individual chapters provide consistently intriguing analyses that demonstrate the wide impact of light pollution. So much of the book is of direct relevance to the environmental advice we try to give in the United Kingdom that I expect it will be helpful around the globe. *Ecological Consequences of Artificial Night Lighting* is an excellent reference that will undoubtedly raise awareness of the need to conserve energy, do proper impact assessments, and turn the lights down.

References

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