Ecological Consequences of Artificial Night Lighting

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Ecological Consequences of Artificial Night Lighting.—Catherine Rich and Travis Longcore [editors]. 2006. Island Press, Washington, DC. 458 pp., ISBN 1-55963-129-5 (paper), 1-55963-128-7 (cloth). $29.95 (paper), $65.00 (cloth).

Humans, especially those of us living in developed countries, tend to take for granted artificial night lighting, be it street, building, park, spot, vanity, pilot-warning, recreational, safety, or other lighting. Furthermore, one can only be struck by the rapid increase in artificial night lighting documented by nighttime satellite photographs of planet Earth over the past three or so decades. Most obvious today are the beams and halos of light radiating from population centers in North and South America, Europe, Russia, Southeast and East Asia, and coastal areas in Australia. Las Vegas, Nevada, is a ''shining'' example of our opulence and blatant wastefulness. What may not be so obvious to the casual observer, or for that matter to the scientific community, are the impacts of artificial night lighting on myriad species of fish, wildlife, and plants. With the publication of *Ecological Consequences of Artificial Night Lighting*, that has all changed.

Organisms evolved and adapted to pre–industrial revolution patterns of predictable periods of light and darkness that varied seasonally in temperate and arctic latitudes. With an increasing human population, refinements in power transmission grids and electrical distribution capacities—especially in wealthy, developed countries—and our unfortunate habit of being incredibly energy inefficient, we now use artificial night light for many purposes. Not unexpectedly, as the use of artificial lights exploded, ''high profile'' examples of affected species surfaced, most notably sea turtle hatchlings and migratory songbirds. This book was developed to provide state-of-the-art reviews and cutting-edge scientific information to address the problem of ''ecological light pollution,'' which is now being documented as a disruptor of ecosystems (Longcore and Rich 2004), with particular reference to the impacts on the flora and fauna within affected systems. The text also provides management recommendations and discusses our knowledge, or lack thereof, of the impacts of artificial night lighting on plants and animals. As a federal wildlife biologist involved in the conservation and management of migratory birds, the material provides me—and hopefully many others—with important tools to help understand the ecological impacts of artificial lighting and to help best manage lights for the protection of all affected species.

For anyone interested in or involved with artificial lighting research or policy-making, this book is a must-read. Whether you're a researcher looking to perform follow-up studies, a state, provincial, federal, or international official trying to address specific management challenges dealing with lighting, an industry representative trying to discern lighting impacts of your company's actions, a conservationist looking to address lighting impacts, or an interested stakeholder simply trying to get informed about the issue, this volume is clearly priority reading.

The book is well organized, well referenced, and easy to read. The volume is divided into six parts, each with multiple chapters, 17 in all. Some of the chapters are tastefully introduced with vignettes (e.g., by Alexander von Humboldt and Henry David Thoreau) or with personal experiences (e.g., by Bernd Heinrich and Carl Safina). The book is organized into taxonomic groupings, with chapters providing reviews of impacts on mammals, birds, reptiles and amphibians, fishes, invertebrates, and plants. Taxonomic groupings are further partitioned into suites of species including land mammals; landbirds, seabirds, and a chapter specifically on the European Black-tailed Godwit (*Limosa limosa*); sea turtles, geckos, anoles, anurans, and salamanders; fish; insects, moths, and fireflies; zooplankton and stream macroinvertebrates; and plants. Most chapters provide a detailed reference list with citations. Virtually all

chapters contain helpful graphs, charts, diagrams, and photographs that help validate the case studies documenting lighting impacts. The final chapter by Catherine Rich and Travis Longcore synthesizes the current state of knowledge about lighting impacts, documented and suspected ecological consequences, and provides suggestions for future research and management.

Chapter 4 by Sidney Gauthreaux and Carroll Belser on the effects of artificial night lighting on migrating birds is an intriguing and informative read for anyone particularly interested in and concerned about this issue. This chapter includes the publication of original research by the authors on tall, lighted communication towers in Georgia and South Carolina. Their study, and replicated research at communication towers in Michigan, is helping the U.S. Fish and Wildlife Service (USFWS) determine best management lighting practices for tall, lighted structures. For example, the USFWS estimates that lighting from communication towers attracts migrating birds, killing at least 4–5 million birds per year in the United States (Manville 2005). In Chapter 5, William Montevecchi examines the influences of artificial light on marine birds and provides a succinct review of direct and indirect influences of lighting, including suggestions for deterrence, avoidance, and mitigation. Chapter 6 by Johannes de Molenaar, Maria Sanders, and Dick Jonkers reviews the impacts of road lighting on grassland birds, including the European Black-tailed Godwit. This chapter also includes original research conducted by the authors, concluding small but statistically significant impacts of road lighting on godwits. The study ultimately provided guidance for road lighting policy implemented by the Netherlands government.

In Part I, Chapter 2 by Paul Beier on terrestrial mammals and Chapter 3 by Jens Rydell on bats are both likely of interest to readers of *The Condor*. These chapters review such issues as the anatomy and physiology of mammalian vision, the influence of moonlight, mammalian circadian rhythms, foraging disruption and the increased risk of predation, disruption of biological clocks, street lighting and mammalian road kills, street lighting and insect prey attraction, disruption of dispersal, and research needs.

Catherine Rich and Travis Longcore, both of whom I have had the opportunity to work with, have an incredible passion for conservation, illustrated by their concerted efforts to integrate cutting-edge science into this book. The book represents the culmination of a 2002 conference on the overall topic of artificial night lighting, as well as other chapters written later by other experts. This book provides anyone interested in the impacts of artificial night lighting with a wide variety of critical scientific knowledge, current research efforts and discoveries, data gaps, mitigation tools, and management recommendations. It should be a primary source for anyone dealing with work related to lights and their impacts on living organisms. It's on my primary source reading list.—ALBERT M. MANVILLE II, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, 4401 N. Fairfax Dr. MBSP-4107, Arlington, VA 22203. E-mail: Albert_Manville@fws.gov

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