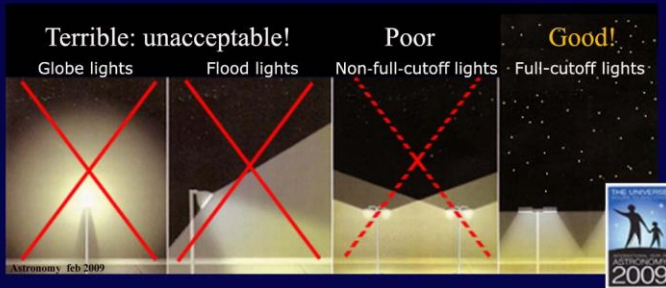


OUTDOOR LIGHT POLLUTION is
 * **HAZARDOUS TO YOUR HEALTH & SAFETY!**
 * **EASY to ELIMINATE!**

DARK-SKY-FRIENDLY LIGHTING can be
VISUALLY ATTRACTIVE!



What is Light Pollution?

- **Sky glow:** bright halo over urban, suburban, and some rural areas at night due to bad outside lighting
- **Glare:** light that shines horizontally and directly into a person's eyes
- **Light trespass:** unwanted artificial light (floodlights, security lights, streetlights) that spills onto property which would otherwise be dark
- **Over-illumination:** artificial lighting that is brighter and on longer than required for a specific activity

Night-Sky-Friendly Lighting

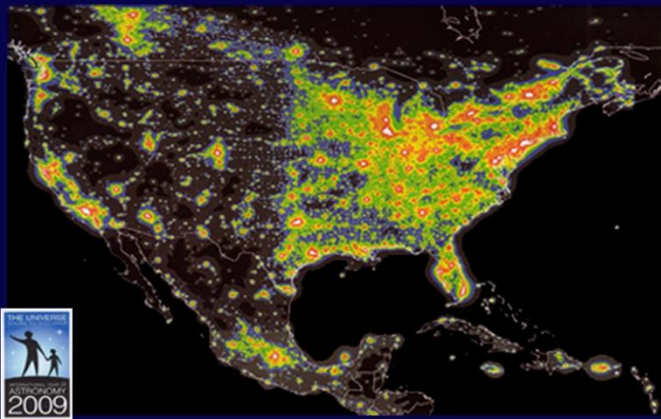
- can be **aesthetically attractive & enhance neighbourhood appearance**
- allows people to move around safely – they are not blinded by glare
- keeps light on ground - where it is needed
- prevents light trespass onto other's property and into their homes
- saves energy, money, and the environment
- keeps night sky unpolluted (www.starrynightlights.com)

Our Vanishing Night. *National Geographic* (November 2008)

Can We Win the War Against Light Pollution? *Astronomy* (February 2009)

for more information: www.darksky.org // www.rasc.ca

LIGHT POLLUTION has LASTING, ADVERSE EFFECTS ON HUMAN & WILDLIFE HEALTH



Light Pollution is one of the **fastest growing & most pervasive** forms of environmental pollution, according to many environmentalists, naturalists, and medical researchers.

Scientific research suggests that light pollution can have **lasting adverse effects** on both human and wildlife health.

Why is Light Pollution so bad? It disrupts biological rhythms!

- Plants and animals, including humans, have 24-hour (circadian) biological rhythms under the control of the daily light-dark cycle.
- Light pollution **hurts diurnal & nocturnal species** by disrupting:
 - **Physiological rhythms**, including hormone levels
 - **Behaviour patterns** (feeding, predator avoidance, courtship, migration)
 - **Reproduction**, leading to population declines & secondary effects on other species (due to the interdependence of plants & animals)
 - **Ecosystems**

Ecological Consequences of Artificial Night Lighting. Rich, Longcore (eds.) (2006)
Environmental Health Perspectives v117 (2009)

for more information: www.darksky.org // www.rasc.ca

BRING BACK THE NIGHT SKY
FOR A HEALTHY ENVIRONMENT



USE GOOD OUTDOOR LIGHT FIXTURES

Light Pollution and Environmental Health

- Insects flying around night lights become too exhausted to feed and reproduce, causing their populations to decline.¹
- Insects are primary food source for many predators (e.g., bats, birds, lizards, frogs). Altering the balances compromises the food chain.
- Bright lights disarm flying moths & other insects of their bat evasion system, tipping this evolutionary arms-race in favour of the predator!
- Bright lights confuse navigation along migratory routes.
- Declines in populations of moths, spiders, sparrows, and amphibians have been correlated with light pollution in the UK & elsewhere.²
- Hatchlings of seed-eating as well as other birds need the protein from insects and spiders in their diet to survive.
- Insects are essential pollinators for many plants. Their decline leads to decline of many plant species – crops, shrubs and trees that provide habitat for many other species, ornamental plants, etc.

¹ The 50,000 streetlights in Zürich estimated to kill more than 1 million insects/night.

² In UK, large moth species declined by 1/3 in 28 years & some species by up to 98%.

Attenborough (2005) *Life in the Undergrowth*

for more information: www.darksky.org // www.rasc.ca



NATURAL NIGHT LIGHT - HEALTHY ENVIRONMENT

Direct light to the ground

Bring back the Night Sky

A child born today has less than a one in ten chance of **ever** experiencing a dark sky.

From time immemorial, humans have marvelled at the night sky, and found inspiration, knowledge, understanding, and pleasure in its beauty...

Light Pollution disrupts natural patterns of light and dark. It changes animal behaviors (confuses navigation, alters competition & predator-prey interactions) and adversely affects physiology and reproduction. **Light Pollution** contributes to lower water quality by preventing zooplankton from feeding on algae, which grow more in light!

Light Trespass from Outdoor Lighting has Indoor Effects! Excessive artificial light can affect production of hormones, disrupt sleep patterns, and have other adverse effects on human health.

Navara & Nelson (2007) The dark side of light at night. *J Pineal Res* 43:215-224
<http://www.citeulike.org/article/1618565>

for more information: www.darksky.org // www.rasc.ca



LIGHT POLLUTION HARMS INSECTS, BIRDS, PLANTS and OTHER ORGANISMS

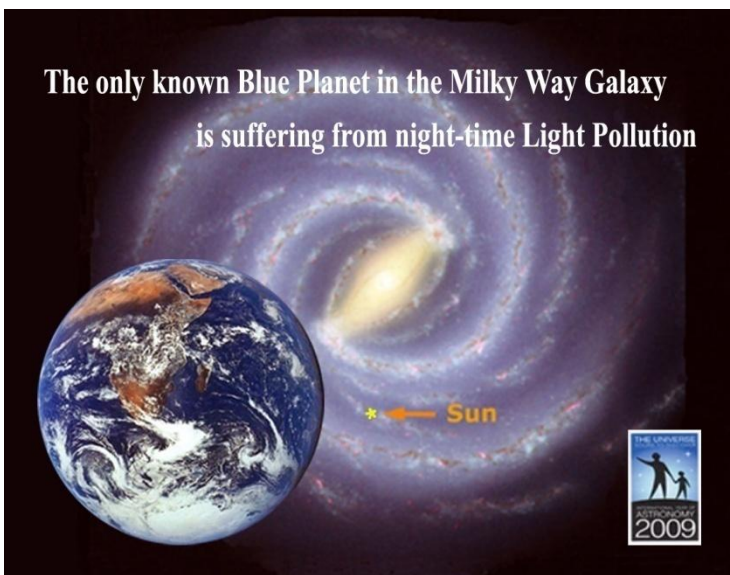
Pernicious Effects of Light Pollution

- Prolonged exposure to artificial light prevents many **trees** and other **plants** from adjusting to seasonal variations.
- This, in turn, has implications for the wildlife that depends on trees as natural habitat.
- Research on insects, turtles, birds, fish, reptiles, and other wildlife species shows that **light pollution alters behaviours, foraging areas, migration timing and routes, and breeding cycles.**
- **Melatonin** is a hormone produced by the pineal gland and secreted at night which is known to help regulate the body's biologic clock.
- Melatonin levels drop precipitously in the presence of excessive artificial light.
- Melatonin triggers a host of biologic activities, possibly including the nocturnal reduction in the body's production of estrogen.

Environmental Health Perspectives 116:A160-A167 (2008)

Navara & Nelson (2007) The dark side of light at night. *J Pineal Res* 43:215-224

for more information: www.darksky.org // www.rasc.ca



The only known Blue Planet in the Milky Way Galaxy
is suffering from night-time Light Pollution

**The blue planet: 3rd from the sun - not too close, not too far
A planet of life to nurture, so life will continue
far into the future.**

**Light Pollution = Wasted Energy, Wasted Money, and
Untoward Modifications of Earth's Surface & Atmosphere**

- One-quarter of all energy consumption worldwide is used for lighting. Lights in homes and offices account for 20%-50% of this.
- Natural resources are wasted (hundreds of millions of barrels of oil & tons of coal burned needlessly; hydroelectric energy wasted).
- Environmental destruction, water and air pollution, and ecological malfunction are increased.

for more information: www.darksky.org // www.rasc.ca



Direct light to the ground!

see:
www.starrynightlights.com



Warblers eat insects, and some capture most of their food on the wing.

- Warblers tend to be **food specialists**. Species having specific food requirements play important roles in limiting insect pest populations.
- Tennessee, Cape May, and Bay-breasted warblers require spruce budworms in their diet to thrive. Their numbers explode in response to budworm outbreaks and decline sharply thereafter.
- **Flood lights & other improper outdoor lighting** impede migration and contribute to reproductive failure and population decline by:
 - causing disorientation of migratory species, including warblers;
 - attracting insectivores to the artificially elevated numbers of insects that become trapped in the glare, thus inducing abnormal behaviour. (See card: *Bring Back the Night Sky for a Healthy Environment*)

for more information: www.darksky.org // www.rasc.ca



Light Pollution & Human Health

- The 24-hour day/night cycle (circadian clock) affects physiologic processes, • brain wave patterns, • hormone production, • cell regulation, and other biologic activities.
- The circadian cycle controls from ten to fifteen percent of our genes.¹
- **Disruption of the circadian clock** is linked to several medical disorders in humans (e.g., depression, insomnia, cardiovascular disease, cancer).
¹ P Sassone-Corsi, Pharmacology Dept, Univ Cal, Irvine
- Dramatic increases in the risk of breast and prostate cancers, obesity, and early-onset diabetes have mirrored the dramatic changes in the amount and pattern of artificial light generated during the night and day in modern societies over recent decades.
- Researchers have concluded that excessive artificial light exposure early in life may contribute to an increased risk of depression & other mood disorders in humans (see card: *Pernicious Effects of Light Pollution*).
- **Excessive artificial light from outside at night** may affect production of hormones, prevent healthy sleep, and have other adverse effects.

Navara & Nelson (2007) The dark side of light at night. *J Pineal Res* 43:215-224
<http://www.citeulike.org/article/1618565>

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