

Wildlife-sensitive Lighting **why and how**

How to provide the light we
need while protecting wildlife
from light pollution

Carrickalinga COMMUNITY
ASSOCIATION

This brochure has been produced by members of the Carrickalinga Dark Sky Community
with support from the Hills and Fleurieu Landscape Board, 2026.

What is light pollution?

Light pollution is the presence of unwanted, unnecessary, excessive or misdirected artificial lighting at night. Like any other form of pollution, it has negative impacts on the world around us. Increasing by almost 10% each year, light pollution is one of the fastest growing threats to the health of life on Earth.

In a very short time, relative to evolutionary scales, we have transformed the night-time environment of much of the Earth's surface. Over 80% of the world's population now lives beneath light-polluted skies. In the United States and Europe this is closer to 99% while in Australia it is about 85%.

We are now experiencing a worldwide disappearance of the night sky, something most of us have never really thought about. However, it is more than our view of the stars that is being lost.

Many of the world's children are growing up never seeing the Milky Way.

Dark Skies and Culture

Narratives surrounding light and dark are powerful reflections of cultural values and knowledge systems.

Cultures around the world deeply integrate the night sky into cosmology, mythology, governance and daily life. The stars and moon have long been used for navigation, food economics and predicting weather and seasons.

Indigenous cultures often emphasise the importance of the land sky connection, with dark skies being an important library for indigenous knowledge systems.

However, since the time of the Enlightenment, Western perspectives have often associated light with truth, knowledge and goodness while darkness is related to danger, fear and evil. Rather than being embraced, darkness is often thought of as something to be banished with light.



The Southern Cross, known as the claw of the Wedge-tailed Eagle, Wirltu. Image credit: Paul Curnow & Gail Gasper.

Wodli parri – The Milky Way

Dark skies on Kaurua Meyunna Southern Country hold deep cultural meaning, carrying ancestral knowledge written in the stars. They guide seasonal movement, ceremony, navigation and ecological care. The Milky Way reflects stories of creation and kinship, reminding community that sky, land and sea are one living Country, shared across generations.

Excessive light pollution disrupts natural rhythms of sky and Country, erasing stars that carry cultural knowledge and seasonal story and change. It affects nocturnal wildlife, migratory birds, and plant cycles, weakening biospheric ecological balance. For community, it disconnects people from ancestral stories, reduces wellbeing, and diminishes opportunities for intergenerational cultural transmission and learning.

Karl Winda Telfer, Burka Senior Man, Mullawirra Meyunna, Dry Forest Southern Country.

Why is light pollution a problem?

All around the world cities and urban landscapes now dazzle with light. The rationale behind minimising darkness is often linked with making the night safer and more beautiful. The question is: safer for whom and what?

Types of light pollution:

- **Skyglow** - brightening of the night sky from urban light, often appearing as a haze of light and reducing the visibility of stars
- **Light trespass** - light falling where it is not intended or needed such as into gardens, trees and shrubs, ground-level habitats, waterways, coastal shallows and bedroom windows
- **Glare** - excessive brightness that causes visual discomfort, impacting road safety and security
- **Clutter** - bright, confusing and excessive groupings of light sources common in commercial zones and transport corridors.

Impacts of light pollution:

1. **Reduces visibility of the night sky** - impacts cultural connection to the night skies, astronomy and stargazing
2. **Wastes energy** - generates heat and contributes to climate change
3. **Wastes money** - due to energy wastage
4. **Damages human health** - exposure to short wavelength blue light hinders the human body's ability to produce melatonin, which negatively affects sleep and contributes to neurological disorders and the incidence of chronic disease
5. **Damages ecological health** - fragments nocturnal habitats, interferes with biological rhythms, and alters many of the behaviours of nocturnal species such as predation and feeding, mating and reproduction, physiology and development, wayfinding and migration.



Source: www.darksky.org

It is a myth that brighter lights create safer places.

There is a common misconception that bright outdoor lighting improves traffic safety and discourages or prevents crime. However, lights that are too bright produce excessive glare which reduces our ability to see clearly. This is of concern for night-time safety in general, including for motorists, pedestrians, cyclists and home environments.

Less intense, warm-coloured light is much better for human visibility and safety.

Human beings are a diurnal species.

We are adapted to be active in the day and rest at night, and therefore our eyesight is adjusted to light rather than to darkness. As with all other species, our biological clocks are intrinsically linked to the natural cycle of light and dark.

The colour of light

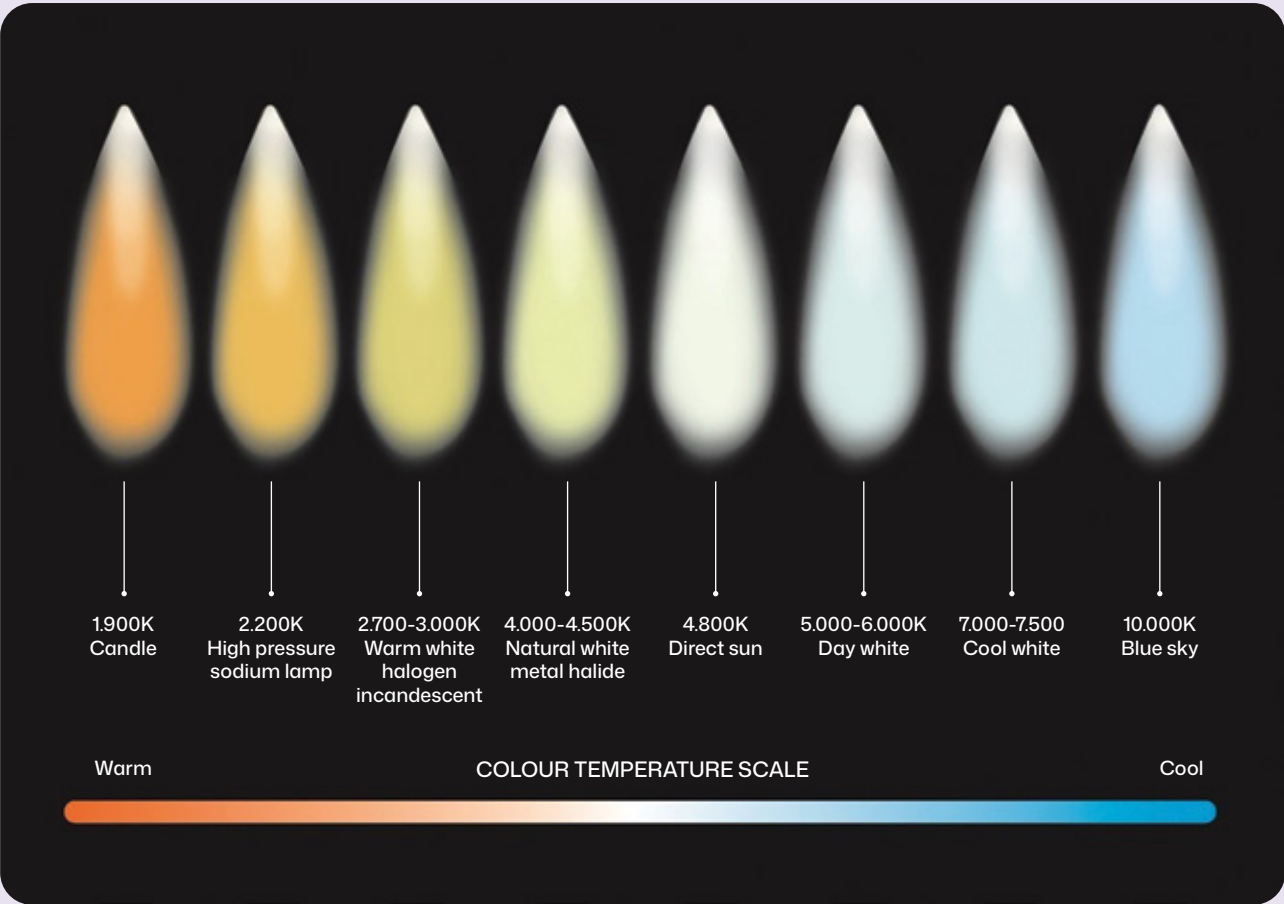
All light has a colour temperature measured in Kelvin (K). Colour temperature ranges from warm white light with a low Kelvin value (e.g. 2700K) to daylight white light with a high Kelvin value (e.g. 6500K). The higher the colour temperature, the brighter the light.

Different animals respond to different colour spectrums. For most wildlife, including humans, the safest light is warm white or amber-coloured light. Sensitivity to high energy, short wavelength UV/violet/blue light is common in wildlife.

The colour spectrum of light varies enormously within urban areas. In recent years we have changed from using warm-coloured light to the bright white light of LEDs. The problem is that although LEDs are more energy efficient, they emit more short-wave blue light, and this is the light that does the most damage. Short-wave blue

light interferes with melatonin production which then affects circadian rhythms and sleep patterns. This results in changed bodily functions and behaviours in animals.

For human and wildlife health it is recommended that our lights should measure no more than 3000K in order to minimise the amount of blue in the light. However, most of our streetlights and other lighting measure much higher than 3000K and are much whiter and brighter than is necessary or healthy.



Source: Department of Climate Change, Energy, the Environment and Water (DCCEEW), National Light Pollution Guidelines for Wildlife, 2023.

Impacts on Wildlife

Our planet has evolved over billions of years with natural cycles of light and dark. Biological rhythms are regulated by light, with the rising and setting of the Sun and phases of the Moon determining both levels of light and duration of exposure. These natural light sources establish cues that tell species when to engage in certain behaviours such as finding food and mates. Some rely on very dim sources of light such as starlight for orientation and navigation.

In Australia, most of our mammals and frogs, along with some bird and reptile species, are nocturnal or active at night. They are adapted to, and depend upon, the natural darkness of the night. Among other things, it helps them avoid the heat of day and minimise water loss.

The presence of artificial light at night alters the natural cycles of light and dark by changing the intensity, colour and timing of

natural light characteristics. Negative effects have been observed among birds, fish, mammals, insects, reptiles, amphibians, insects and other invertebrates, molluscs, plankton, micro-organisms and plants.

Light pollution reduces the quality of habitat, disrupts the connection between nocturnal species and their habitats, interferes with biological processes and changes how species interact with the environment.

*To go in the dark with a light
is to know the light.
To know the dark, go dark.
Go without sight,
and find that the dark, too,
blooms and sings,
and is travelled by dark feet
and dark wings.*

- Wendell Berry



Photography credit: M. Stokes

Ecological impacts of light pollution

Light pollution affects terrestrial, aquatic and aerial wildlife in many ways. It threatens the survival of individuals and populations through disruptive effects on feeding, nutrition, growth, health, movement, navigation and reproduction.

Navigation

The ability of migratory birds to undertake long-distance migration critical to their lifecycles is compromised by the artificial light of cities and towns, ships and oil rigs, and other infrastructure on both land and sea. Birds can become disorientated and never reach their destinations. In addition, positive phototaxis (attraction to light), leads to many collisions with brightly lit infrastructure.

Hatchling marine turtles rely on the natural glow of the horizon to guide them towards the safety of the sea. When beaches and coastal towns are brightly lit the baby turtles are drawn off course and cannot find their way to the ocean.



Red Knots (*Calidris canutus*) travel from the Arctic to spend the non-breeding season (summer) along the South Australian coast
Photography credit: M. Stokes

Behaviour change

Small animals such as micro-bats, possums, bandicoots and wallabies will avoid living in habitat that is artificially lit. If there is no alternative dark habitat for them, they will reduce their feeding and reproductive activity.

Many animals can become disoriented and stressed by bright, flickering and reflected light. This can result in changes to behaviours such as finding mates, sleeping and feeding. Some animals, such as Marbled geckos, will not feed in the presence of any light.

Barn owls avoid brightly lit areas and struggle to find suitable nesting sites. They become disoriented by bright lights, sometimes leading to collisions or becoming grounded. Many are forced to spend more energy on essential activities such as hunting and calling which impacts their overall fitness, especially when raising young.

For Southern Boobooks artificial light disrupts nocturnal hunting, hinders foraging for insects, alters hormonal cycles, confuses their navigation and makes them prone to collisions.



Marbled geckos (*Christinus marmoratus*) are small, nocturnal lizards that live in dark, sheltered places and prefer to feed under cover of darkness
Photography credit: M. Stokes



Fatal attraction

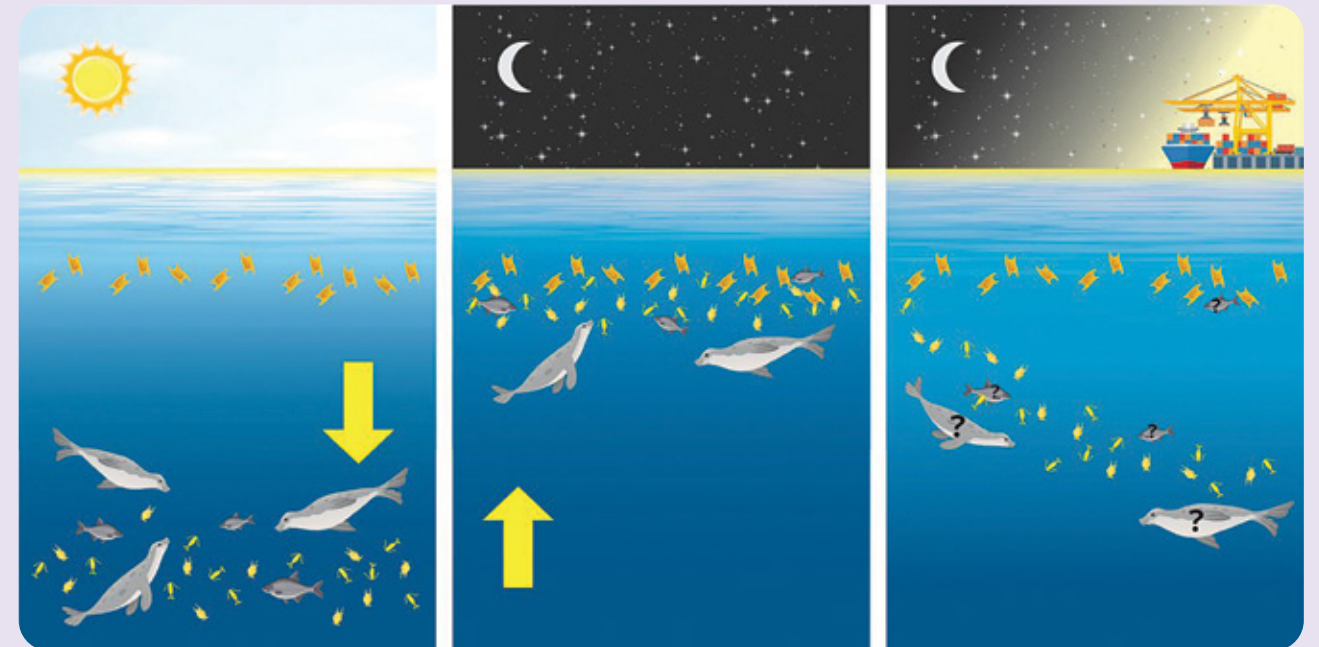
Many species of insects are attracted to the short-wave light of bright lamps and LEDs. They become trapped and fatigued, and it is common to find an abundance of deceased insects around the base of bright night lights. This 'fatal attraction' is contributing to the decline of insect populations globally.

Predator prey relationships

Artificial light increases exposure of prey species to predators and changes the dynamics of their relationships. For example, insects like moths, flies and crickets are attracted to outdoor lights. Frogs are then attracted to the insects as easy prey and, in turn, Tiger snakes are attracted to the frogs.

Impact on plants

Artificial light at night can lead to physiological changes in plants. It can interfere with flowering times, leaf budding, fruit ripening, photosynthesis, pollination, growth shape and leaf thickness. This in turn impacts the insects, birds and other animals dependent on flowering or fruiting times.



Source: Department of Climate Change, Energy, the Environment and Water (DCCEEW), National Light Pollution Guidelines for Wildlife, 2023.

Aquatic ecosystems

Light pollution affects both freshwater and marine habitats. The behaviour and physiology of many aquatic organisms are regulated by natural cycles of light and dark.

In marine and coastal environments, artificial light from cities, ships and rigs can reach depths of hundreds of metres. More than 22% of the world's coastal ecosystems are exposed to artificial light at night.

Artificial light at night can disrupt camouflage, navigation, foraging, spawning and predator-prey relationships. For example, it leads to increased predation

on seafloor communities of animals such as barnacles, sponges and bivalves. It can prevent eggs from hatching by masking the natural darkness needed, alter sleep-wake cycles and increase stress.

Zooplankton are a good example. Zooplankton minimise risk of predation by spending daylight hours in deep dark waters, then rise to the surface at night to feed on phytoplankton. Light pollution can suppress this upward vertical movement and lead to a reduction in populations of zooplankton. Zooplankton are the foundation of the marine food web and so light pollution has a ripple effect on the ecosystems of the ocean.

What can **we** do?

Dark sky does not mean dark ground.

Responsible lighting meets our need to see at night, conserves energy, avoids harmful effects on wildlife and people, and protects the night sky.

Five simple principles for responsible outdoor lighting:

1. Useful

Start with natural darkness and use light only where it is needed. All light should have a clear purpose. Consider how the use of light will impact adjacent areas, including wildlife and habitat.

2. Targeted

Light only the object or area intended. Target the direction of light so that it minimises light directed upwards and shield the light source to avoid outward light spill.

3. Low intensity

Use the lowest intensity lighting appropriate for the task. Be mindful that some surfaces may reflect more light into the night sky than others and adjust illumination accordingly.

4. Controlled

Use adaptive light controls such as timers, sensors and dimmers to ensure light is available when needed, dimmed when possible, and turned off when not required.

5. Warm-coloured

Use warm-coloured lights and limit the amount of short wavelength (blue-violet) light to the least amount required. Remember - most animals including ourselves, are sensitive to short wavelength light which creates blue and violet colours.

To complement these principles there are many other actions we can take such as:

- Choose fittings and fixtures that are *Australian Dark Sky Alliance* (ADSA) approved
- Use Dark Sky International's Home Outdoor Lighting Assessment tool
- Prevent indoor lights from shining outdoors into gardens and trees
- Avoid shining lights onto beaches, waterways and bushland
- Avoid leaving outdoor lights on at night unless essential
- Learn about local plants, animals and their ecosystems, and how they respond to artificial light at night.

Reflective surfaces amplify light pollution.

When artificial light at night is directed downward, water, pavements and other light-coloured surfaces scatter light upwards into the atmosphere.

Clouds, especially low altitude clouds, also amplify light pollution, reflecting light back down to the ground below. As cloudiness increases in light-polluted places, the brightness of skyglow also increases.

This threat applies not only to the centres of large cities, but also to protected areas, such as national parks and nature reserves, located within or close to urban places.

Dark Sky Places

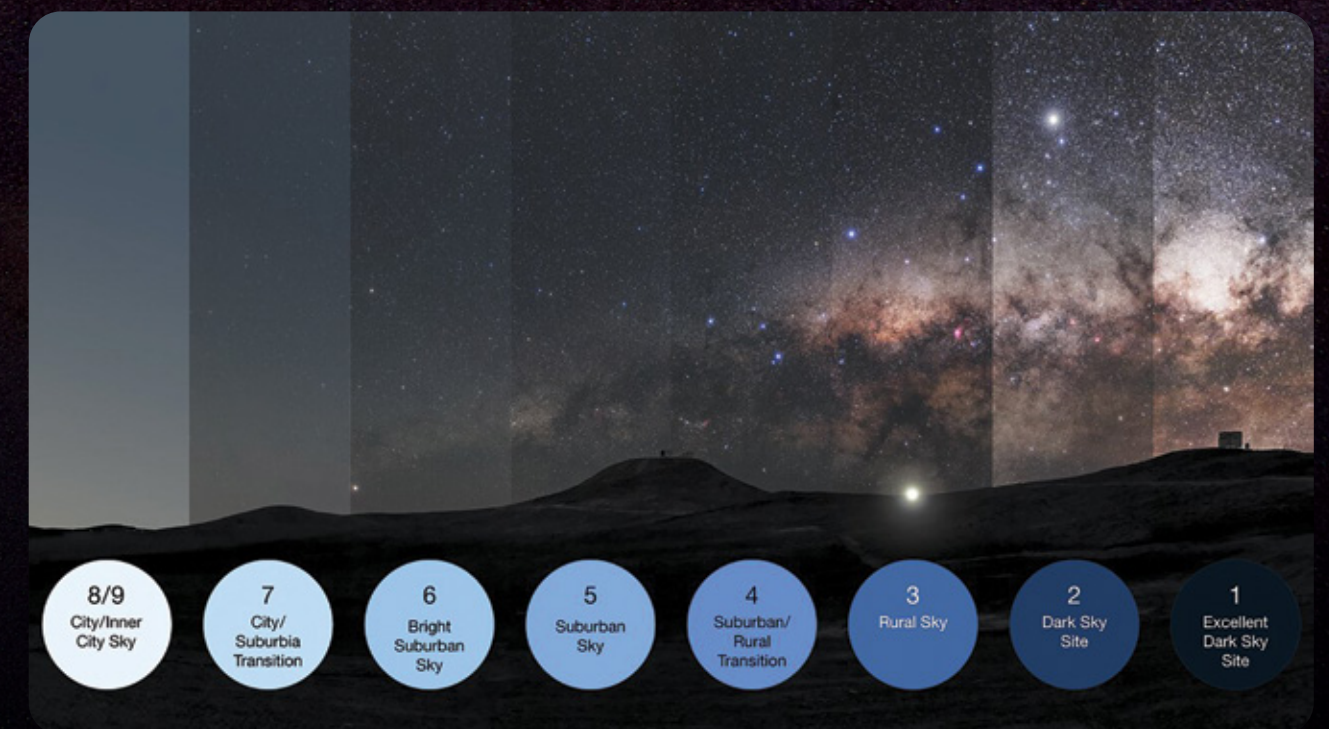
Dark Sky International has accredited over 250 Dark Sky Places around the world where communities are working to reduce light pollution and empower people to take action to protect the night sky. Australia currently has eight recognised Dark Sky Places.

The Carrickalinga Dark Sky Community on the Fleurieu Peninsula was declared in May 2024, joining the River Murray Dark Sky Reserve and Arkaroola Dark Sky Sanctuary as Dark Sky Places in South Australia.

Research is underway all around the world to further understand light pollution and its impacts on the night sky, ecological health, human health, public safety, energy use and climate change, social justice and space light pollution.

Although light pollution is a global problem, there are many actions we can all take to help reduce the impacts. Whether working together in communities, in government, in business or in our homes, we can all think carefully about how we use light at night.

The Bortle Scale



The Bortle scale is a way to measure the quality (brightness) of the night sky in a particular location. There are 9 levels to the Bortle scale with level 9 being the most extreme amount of light pollution.

Resources

The *Australian Dark Sky Alliance* (ADSA) is an independent, not for profit organisation dedicated to reducing light pollution and preserving the night for people, wildlife and future generations.



Australia's Leader in Dark Sky Policy: Australasian Dark Sky Alliance



ADSA Approved Lighting database: ADSA Approved Lighting - Australasian Dark Sky Alliance

DarkSky International (DarkSky) is the globally recognised authority on light pollution issues and night sky conservancy.



DarkSky International: Protecting the night skies for present and future generations



DarkSky's Home Outdoor Lighting Assessment: DarkSky International



State of the Science 2025: DarkSky International

The Australian Government's National Light Pollution Guidelines for Wildlife outline the process to follow where there is potential for artificial lighting to affect wildlife.



National Light Pollution Guidelines for Wildlife

The Biodiversity Council's Helping wildlife through lighting choices: The effects of light pollution on Australian wildlife looks at which species are being impacted and makes recommendations on how to minimise harmful impacts on nature.



Impacts of artificial light on wildlife

Additional References

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Artificial Light at Night: State of the Science 2025 State of the Science 2025 | DarkSky International

Photography Credits

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Publication Design

MADFOX Design

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