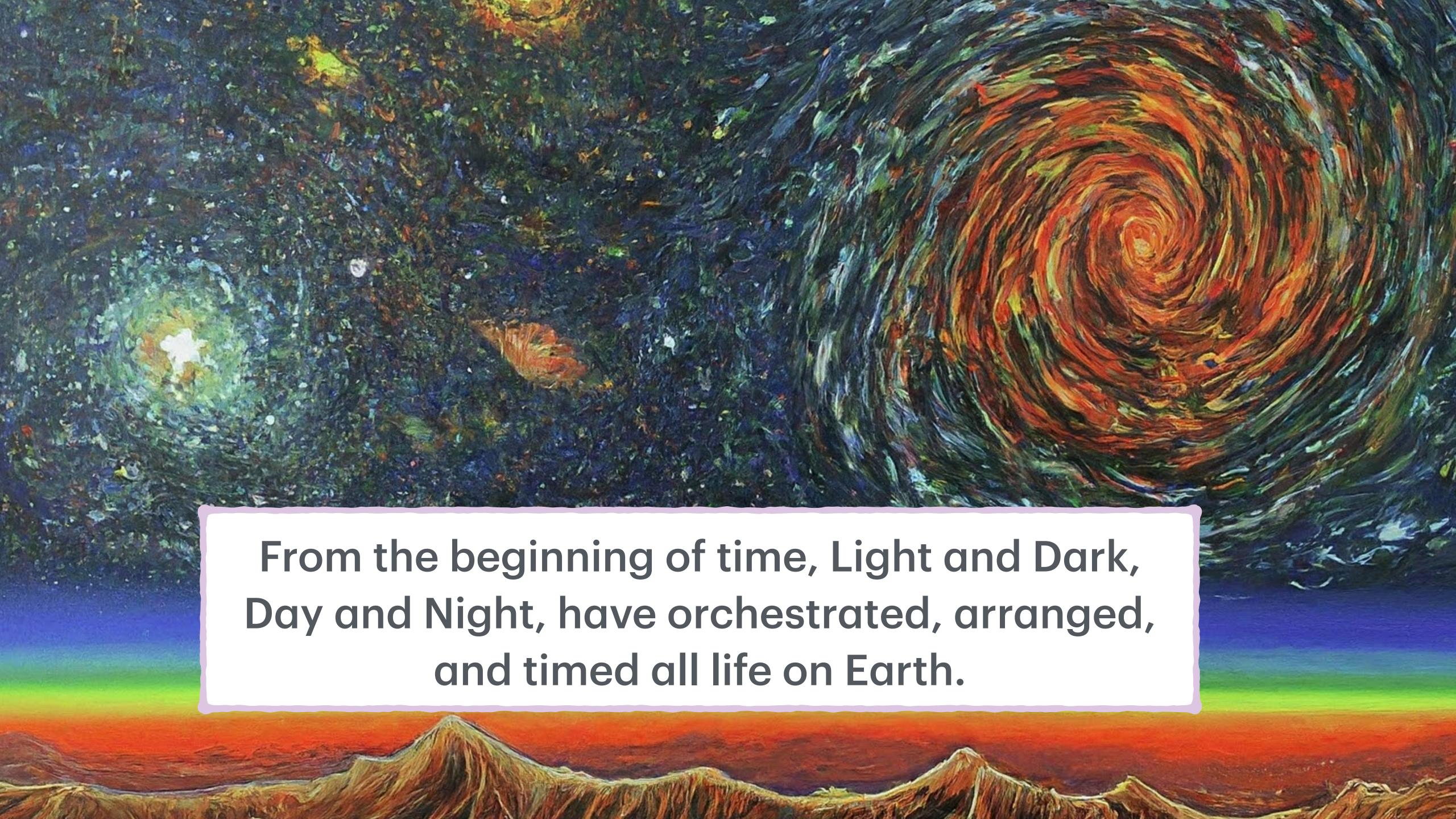
Dark Skies: Do We Need the Dark?

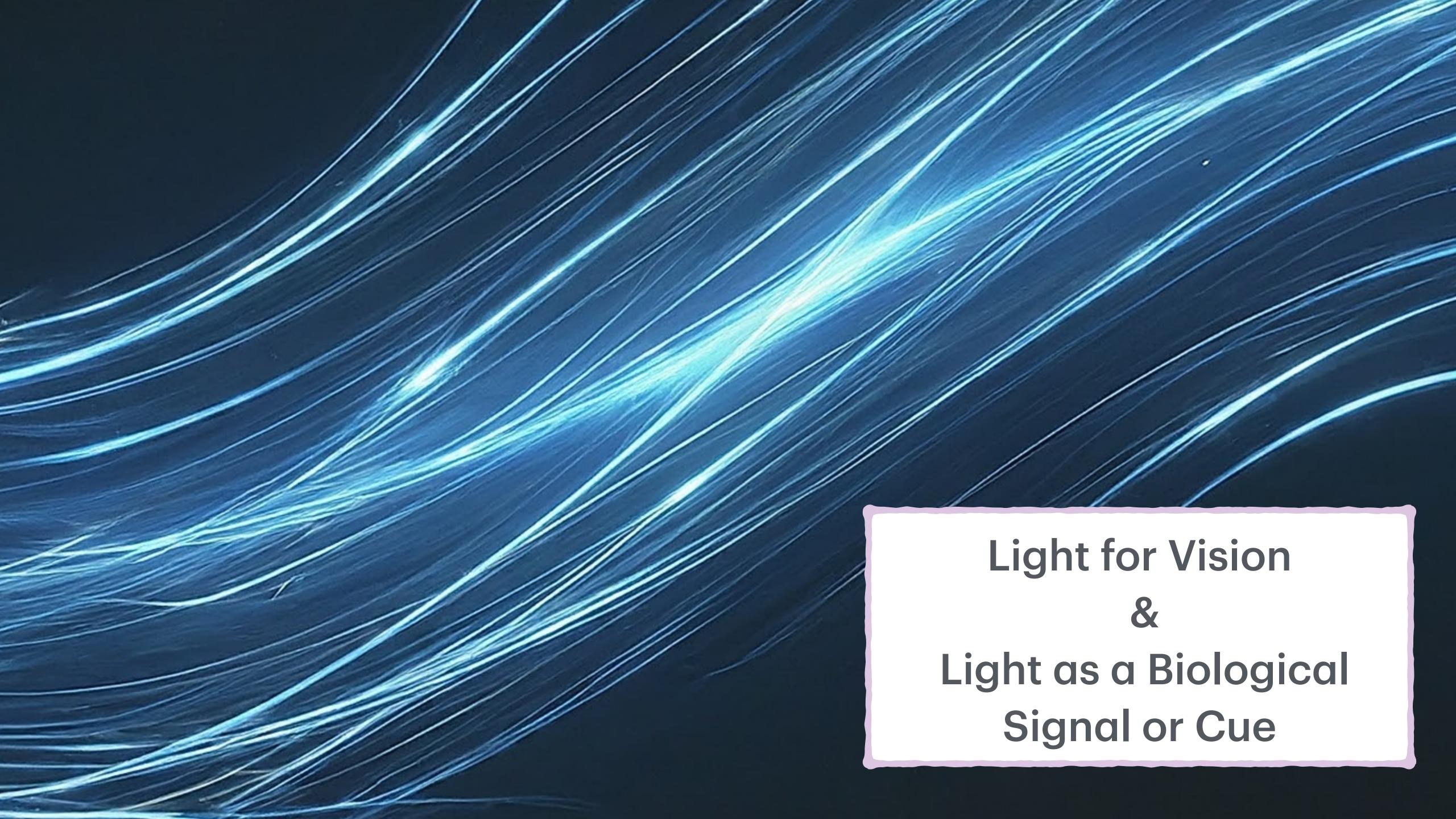
The Importance of a Naturally Dark Night Sky

A call to preserve the natural night sky and to conserve the nocturnal environment through the responsible use of artificial light at night.











All light at night has consequences for all living organisms based on vision.

- Altered predation advantages, disadvantages, and opportunities
- Loss of darkness as camouflage, changes in visibility or ability to hide
- Light capture, drawn to and then fear of leaving an area or inability to leave
- Unnatural activity levels at the wrong time
- Disrupted migration paths sending birds into dangerous environments
- Masking of mating signals
- Loss of natural nocturnal habitat (half the habitats on Earth)
- Biodiversity, population and biomass loss

All light at night has biological consequences for all living organisms

Changes the timing of seasonal rhythms

Induces mistimed nesting, breeding, and egg laying

Diurnal species foraging at night

Desynchronization of Nature



Mis-timing of food availability and requirements

Timing of migrations

Plant-Insect-Animal Synchrony

Loss of entrainment in individuals, species, ecosystems

Many nocturnal mammals and aquatic environments are affected by < 0.1 lux (Full Moon)

Nature's Law of Reciprocity

All living organisms receive and provide services to other individuals, species, and habitats.

All ecosystems receive and provide through mutualistic relationships with other ecosystems.

The diurnal and nocturnal, exhibit the same pattern.

Diurnal-Nocturnal Reciprocity

Resource Partitioning:
Reduced Competition in the same habitat
Diverse Food Webs

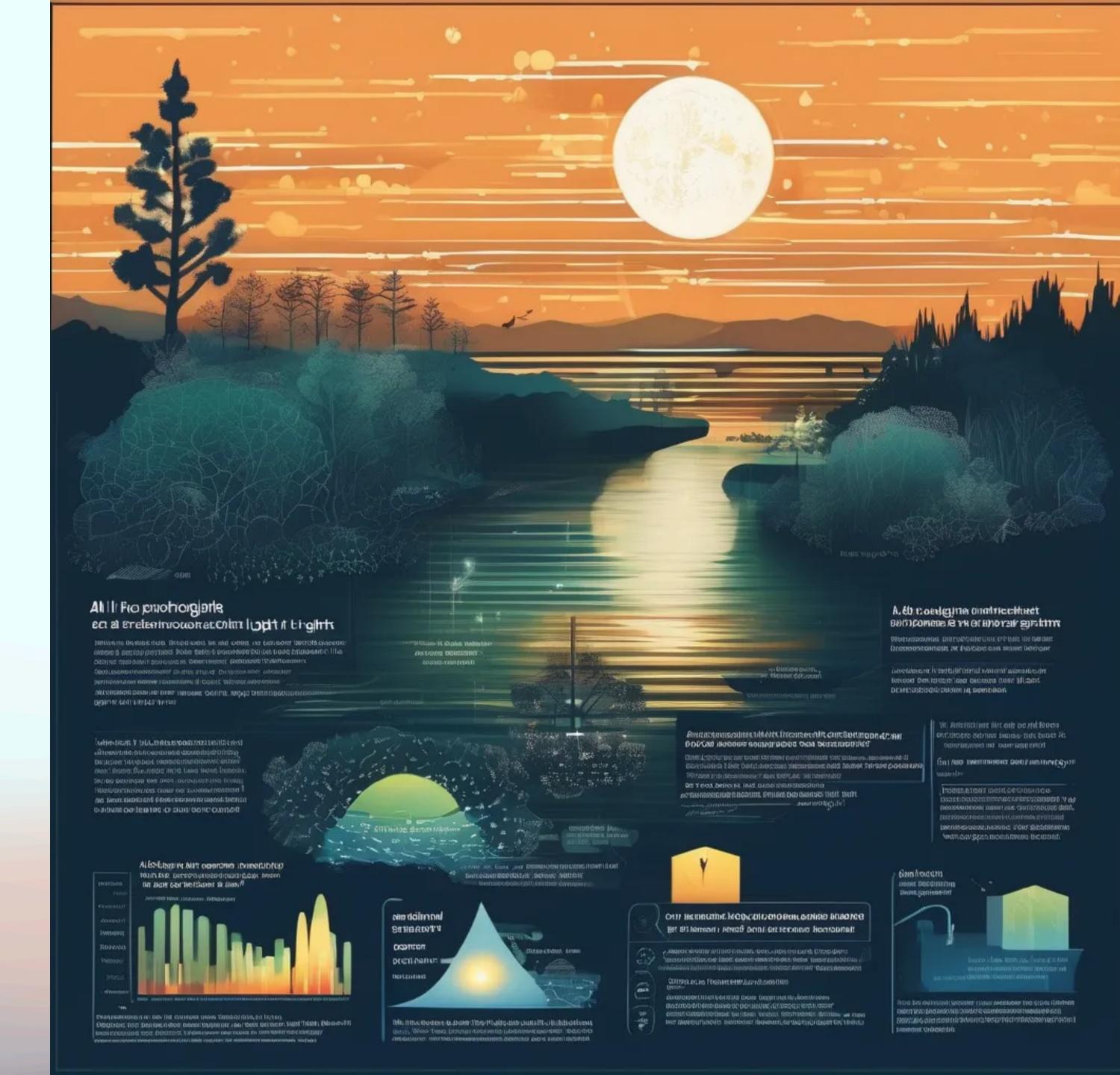
Predator Prey Dynamics:
Balanced Populations
Reduced Predation Pressure

Nutrient Cycling: Efficient Nutrient Exchange Pollination and Seed Dispersal

Habitat Maintenance:
Different Animals shape Habitat
Ecosystem Services

The diurnal and nocturnal work together to create a more resilient, healthy and productive ecosystem.

All artificial light at night is a pollutant, an unnatural substance released into the natural environment with a growing number of known consequences. It degrades and destroys the nocturnal habitat.



Light Pollution

Seriously Underestimated

- Direct biological and vision related impacts to all species
- Changes the interactions between organisms in an ecosystem
- Changes the biodiversity and ecological function within an area across all of its ecosystems
- Disrupts the services provided by eliminated or stressed organisms within the ecosystem
- Causes DNA expression alterations as organisms try to adapt and survive the rapid increase of nighttime lighting, an altering of traits, physiology, and behavior that echoes across whole ecosystems





The Human Character

The night sky is a major resource for cultural identity, culture-based knowledge, wisdom, and heritage.

An invisible night sky is a huge loss for the humanities, stealing inspiration for faith, art, dance, music, writing, and oral tradition.

Due to light pollution, we lose access to nature's open encyclopedia of curiosity and STEM encouragement for our children. A loss for both amateur and professional science.

The loss of a naturally dark night sky disconnects us from nature, a source of peace for the mind and soul. As a common resource, it belongs to the people of our State and is protected by the Pennsylvania Constitution.

Five Lighting Principles for Responsible Outdoor Lighting





1 Useful

Use light only if it is needed

All light should have a clear purpose. Consider how the use of light will impact the area, including wildlife and their habitats.



2 Targeted

Direct light so it falls only where it is needed

Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.



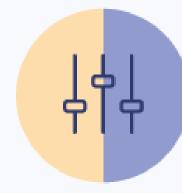
3 Low Level

outdoo

Responsible

Light should be no brighter than necessary

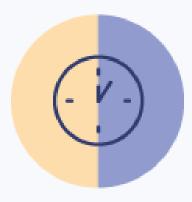
Use the lowest light level required. Be mindful of surface conditions, as some surfaces may reflect more light into the night sky than intended.



4 Controlled

Use light only when it is needed

Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.



5 Warm-colored

Use warmer color lights where possible

Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.



Five Lighting Principles for Responsible Outdoor Lighting

Which sustainable lighting practices help sustain insects?

1 Useful

2 Targeted

lighting

sible

Respon

3 Low Level

4 Controlled

5 Warm-colored



Temporal disorientation

Slowing or speeding of daily and seasonal rhythms of development and reproduction



Fatal attraction

Compulsive flight-to-light behavior that supersedes fitness-related behaviors



Spatial disorientation

Impairment to navigational ability caused by the concealment of celestial light cues



Visual confusion

Impairment to ability to visually recognize relevant resources in the environment



DarkSky International Policy Outdoor Lighting – Municipal Ordinance Template and User Guide

October 11, 2024 – Version 1.0

Pennsylvania's Treasure

Naturally Dark Places & SQM Measurements

- Calculating Night Sky Luminance
- SQM reading is magnitudes per square arcsecond
- 100^{((22-SQMReading)/5)} = times the natural night sky's luminance
- My home, 18.00 or 39 times the natural
- Naylor Observatory, Lewisberry, Astronomical Society of Harrisburg, 19.55 or 9.55 times the natural, a portion of the Milky Way visible as a faint mist directly above..
- King's Gap, Education Building parking lot with lighting on, 20.04, 6.0814 times the natural
- King's Gap, Education Building parking lot with lights off, 20.30, 4.786 times the natural, Milky Way visible.
- Colonel Denning, June 2023, 21.03, 2.443 the natural, Milky Way very visible with sparkle
- Lumber Heritage, near Emporium, PA. 21.70, 1.318 times the natural
- Only about 20% of Americans can see the Milky Way from where they live
- As nocturnal habitat shrinks, a place with a naturally dark night sky is a treasure to people and to the wildlife who live there or pass through during migration seasons.



A naturally dark night sky is a foundational part of any conservation or sustainability strategy. For without a naturally dark night, we will lose it all, both the day and the night.

TO PROTECT THE DAYTIME ENVIRONMENT, THE NIGHTTIME ENVIRONMENT HAS TO BE PROTECTED AND PRESERVED AS THEY ARE AN EQUAL PART OF THE SAME ENTITY.



Resources

- DarkSky International Website www.darksky.org note new code and ordinance templates, research database, 5 principles of responsible outdoor lighting
- DarkSky International Youtube channel https://www.youtube.com/@DarkSkyInternational
- travislongcore.net
- owenslab.org
- The Ecological Consequences of Artificial Light at Night, Catherine Rich, Travis Longcore
- The Darkness Manifesto, Johan Eklof
- https://www.youtube.com/watch?v=iTPIKBLT9v8, Johan Eklof
- Braiding Sweetgrass, Robin Wall Kimmerer
- Starborn Roberto Trotta
- <u>lightpollutionnews.com</u> <u>Bill McGeeney</u> podcast and resources
- Lights Out Audubon https://www.audubon.org/our-work/cities-and-towns/lights-out
- <u>unihedron.com</u> Sky Quality Meter
- https://markwestmoquette.co.uk/ Mindful Stargazing
- Guided Night Hikes, like: https://www.llbeanoutdoors.com/activity/full-moon-hiking-tour-pittsburgh
- The Circadian Code, The Circadian Diabetes Code Satchin Panda PhD

DarkSky International

DarkSkyPA Chapter

- Raise awareness of the effects of artificial light at night
- Advocate for the restoration and preservation of the natural nighttime environment
- Protect communities and Creation from the harmful effects of light pollution
- Promote responsible outdoor lighting
- Promote night sky recreation and wellbeing activities, events and places.
- darkskypa.org@gmail.com
- gtar4jc@gmail.com







