

CARE Committee

From: Axel I. Beers
Sent: Tuesday, February 22, 2022 5:24 PM
To: CARE Committee
Cc: Kelly King
Subject: Presentations for Feb. 23 CARE Committee
Attachments: Haleakala-dark-sky-Maui-council.pdf; 2022_02_22_CARE_Committee_MNSRP_OLO_Comment.pptx

Aloha,

I am attaching two presentations for Feb. 23 CARE Committee.

- File beginning in "Haleakala..." is the presentation by Dr. Richard Wainscoat.
- File beginning in "2022_02_22..." is the presentation by Jay Penniman.

Thank you,
Axel



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Now is the time to provide input to update the South Maui Community Plan! <https://southmaui.wearemaui.org/get-involved/>

we are
SOUTH MAUI

Protection of the dark night sky over Haleakala

Richard Wainscoat
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Existing Lighting Ordinance

- The present lighting ordinance dates back to 2007
- It requires full shielding of most lights
- It does not require metal halide lamps to be fully shielded (MH lamps are common in sports lighting)
 - This is a major weakness. Metal halide lamps are very damaging to astronomy (they are essentially an enhanced mercury light, with lots of blue light)
- There are no spectral limitations on blue (and green) light from LEDs
- Blue light is very damaging to astronomy because it is easily scattered by the atmosphere

Night time astronomy on Haleakala

- Haleakala is the best observatory site in the world for studying the Sun, and may be the second best site in the United States (after Maunakea) for night time astronomy
- Pan-STARRS - two telescopes searching the sky every night for Near-Earth Objects
- ATLAS - one telescope searching for Near-Earth Objects
- Faulkes telescope - part of Las Cumbres Observatory
- Air Force Telescopes

How to keep the sky dark for astronomy

- Shielding is critically important - light should not be emitted at angles above the horizontal
- Use only the amount of light that is needed - do not overlight (this also wastes energy)
- Many of Maui's streets have been overlit
- Limit the amount of blue (and green) light because those are colors are more easily scattered by air molecules

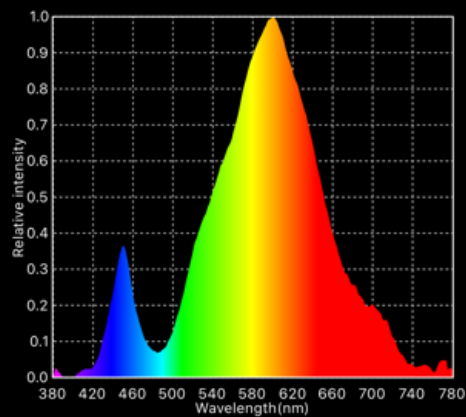


LED installations

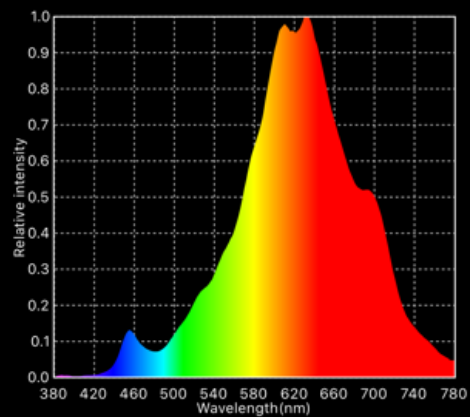
- LEDs have come into widespread use in the last 10-15 years
- Early LED technology was much more energy efficient at higher color temperatures such as 5000 K (blue-rich)
- Early adopters of LED lighting on Maui included hotels who chose blue-rich LED light because of energy efficiency considerations and rebates offered through Hawaii Energy
- Blue-rich LED light is very damaging to astronomy and to wildlife
- The present lighting ordinance offers no protection from blue-rich white light

LED installations

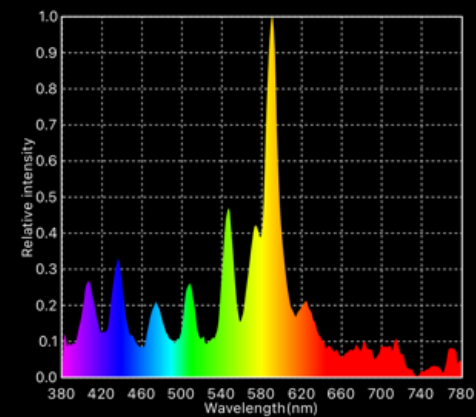
- Over the last few years, the energy efficiency of lower color temperature (warmer appearance) LEDs has increased dramatically



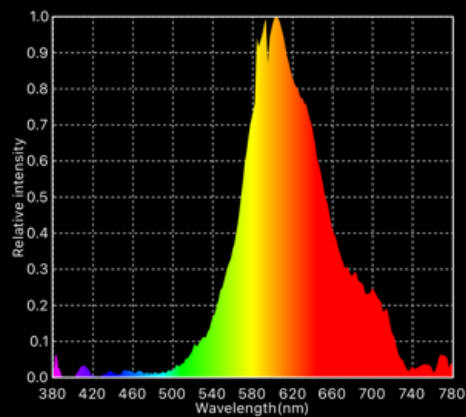
2700 K



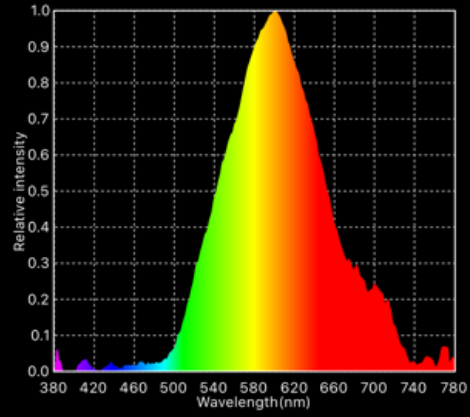
2000 K LED



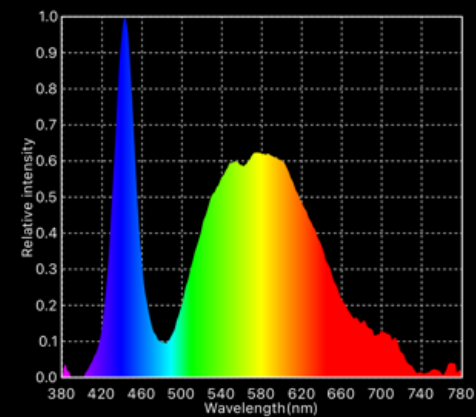
3500 K Metal Halide



PC Amber LED



Filtered 3000K LED

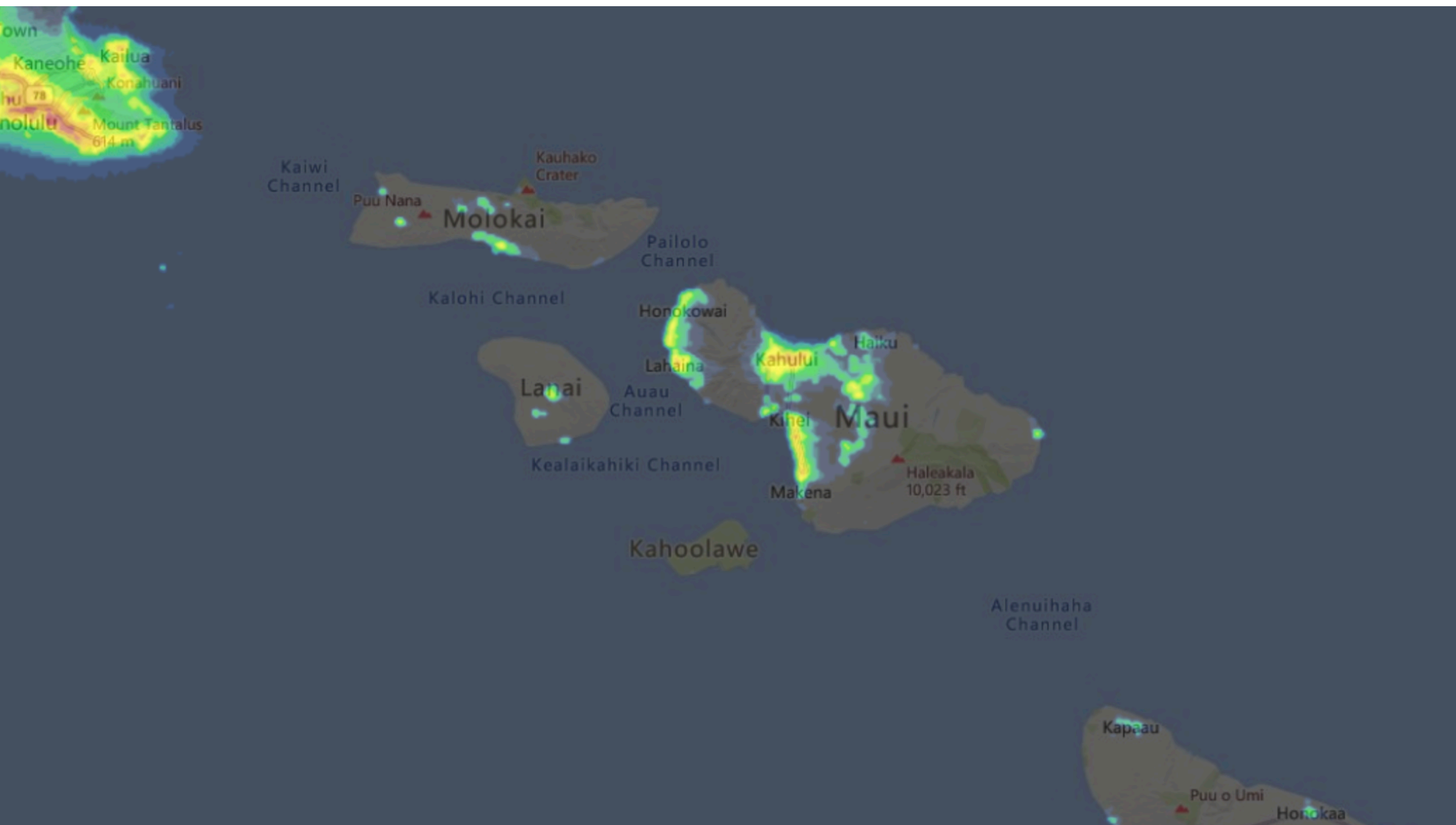


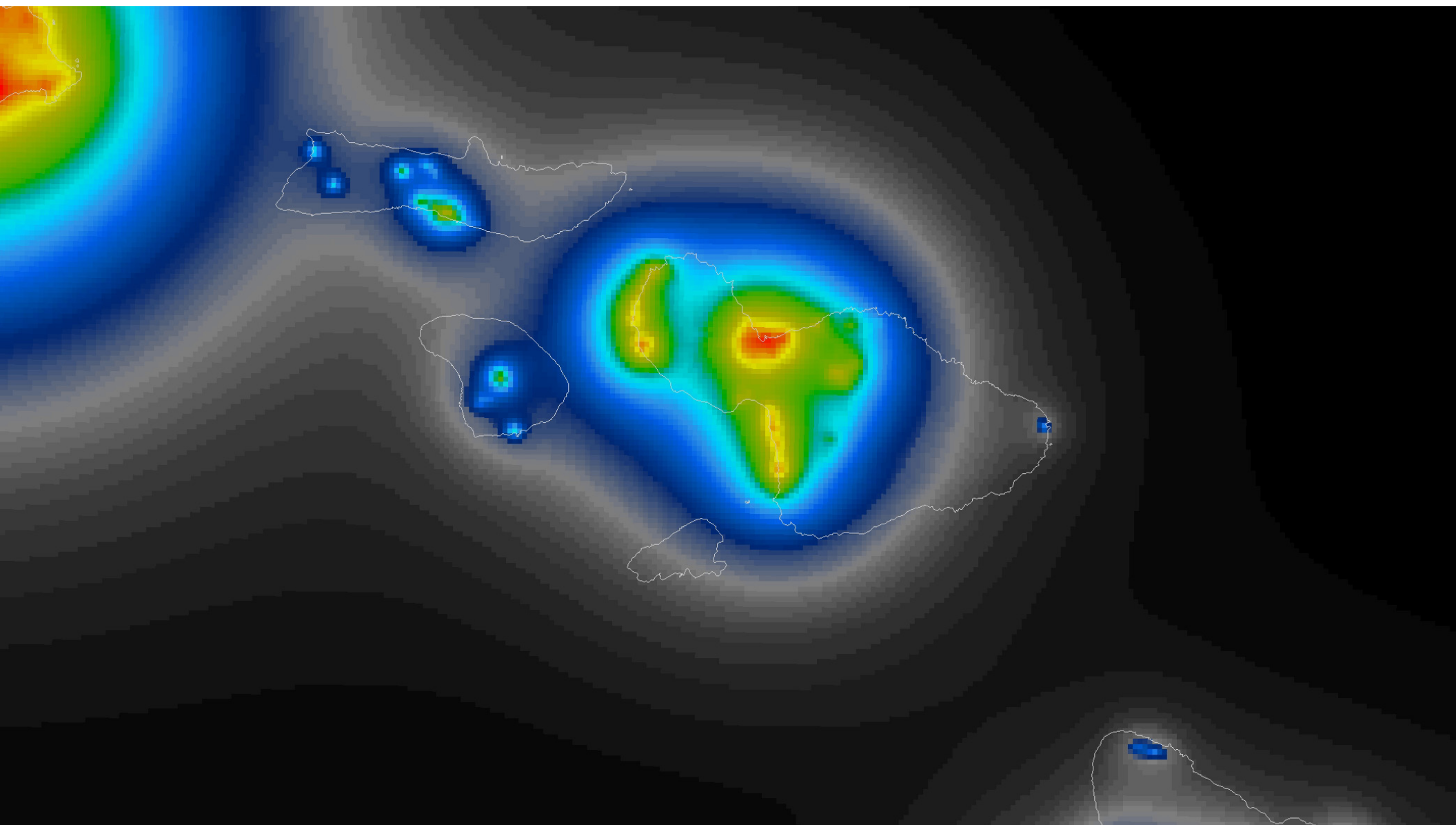
4600 K LED

Street lights

- The spectral limitations on blue and green light sought to protect birds and turtles are well matched to what is needed to protect the dark night sky for astronomy
- The County of Hawaii lights have no light below 500 nm (no blue light)
- Maui is much smaller than the Big Island, and people live much closer to Haleakala than to Maunakea
- More stringent limitations are therefore desirable







Addressing Maui County Outdoor Lighting Ordinance – Bill 21



Comment from Maui Nui Seabird Recovery Project

Maui County has seen an increase in night time lighting

We are losing night dark sky to the detriment of our quality of life

We can rectify this loss, and in so doing, build coastal resiliency with healthy wildlife populations, among other positive benefits

Relating to impacts of night time lighting on seabirds, turtles and wildlife

Night time lighting disrupts the circadian rhythms of animals and plants

We all need to have light free nights for optimal health

Hutchinson, Lois I. 2016. Eco Effects of High-CCT LED Lighting Outdoors: Building a Case
WestCoast Lighting Insider, Mar 22.

IDA cites the case against bluish-white light in terms of:

Discomfort Glare

Circadian Rhythm Disruption

Light Scattering

Sky Glow

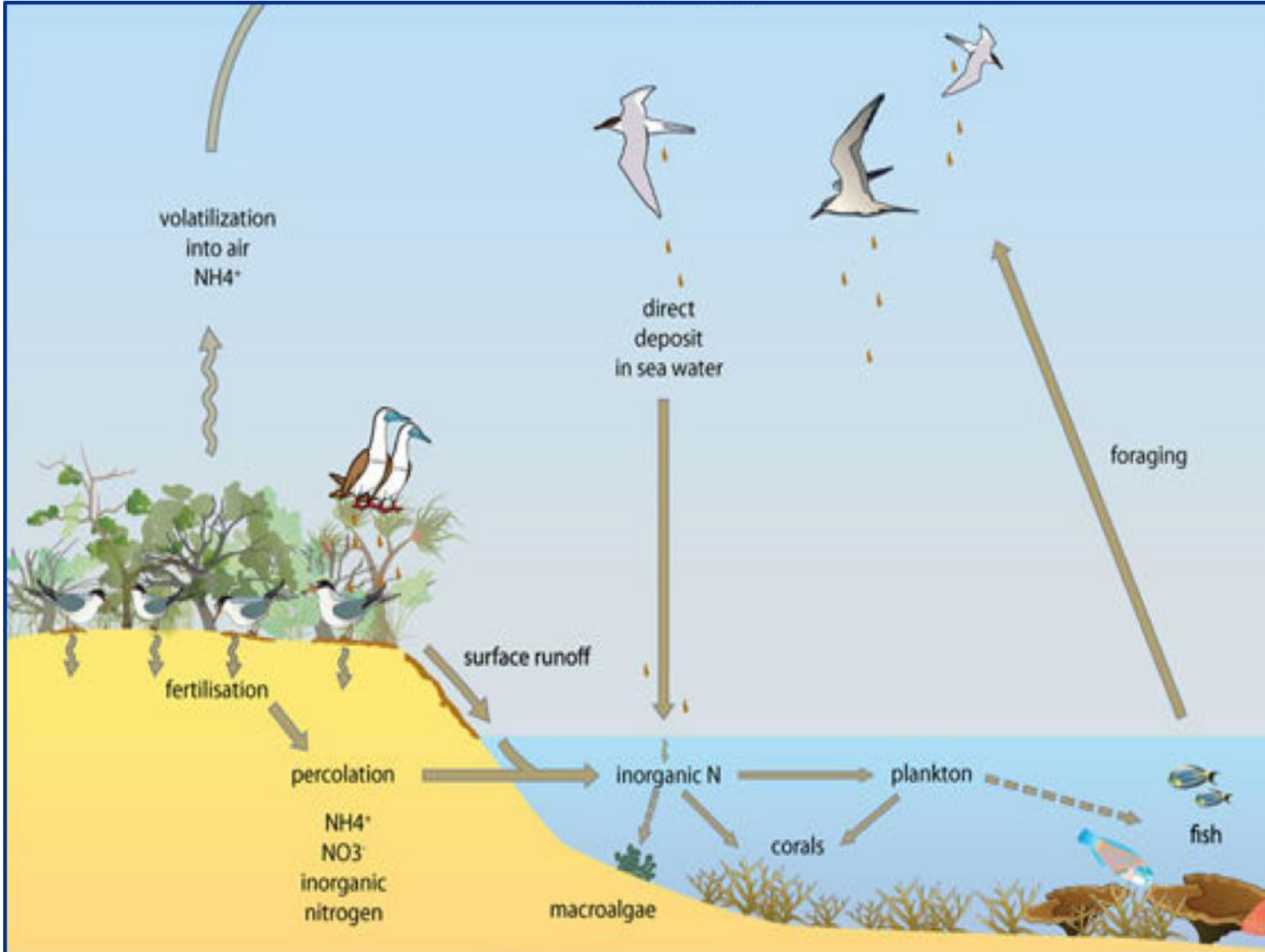
Biological System Disruption

“Bluish-white light” = Visible Light Wavelengths < 550 nm



The correlated color temperature (CCT) is a specification of the color appearance of the light emitted by a lamp relating its color to the color of light from a reference source when heated to a particular temperature, measured in degrees Kelvin (K).

What roles do seabirds play in coastal habitats?



Seabirds bring essential nutrients from the sea to the land.

Guano contains organic nitrogen and phosphorus.

Fertilisation happens on land and in near-shore waters.

2021 Seabird Fallout

- HAPE
- WTSH
- WTTR



Species - Age	Count - Sum	
BWPE – Adult	1	
HAPE – Adult	2	21
HAPE – Hatch Year	19	
WTSH – Adult	16	64
WTSH – Hatch Year	48	
WTTR – Hatch Year	1	
LHSP – Adult	1	
NESH – Adult	2	

2021 Seabird Fallout

"Found 'flopping around in the main lobby'"
-- Marriott Wailea

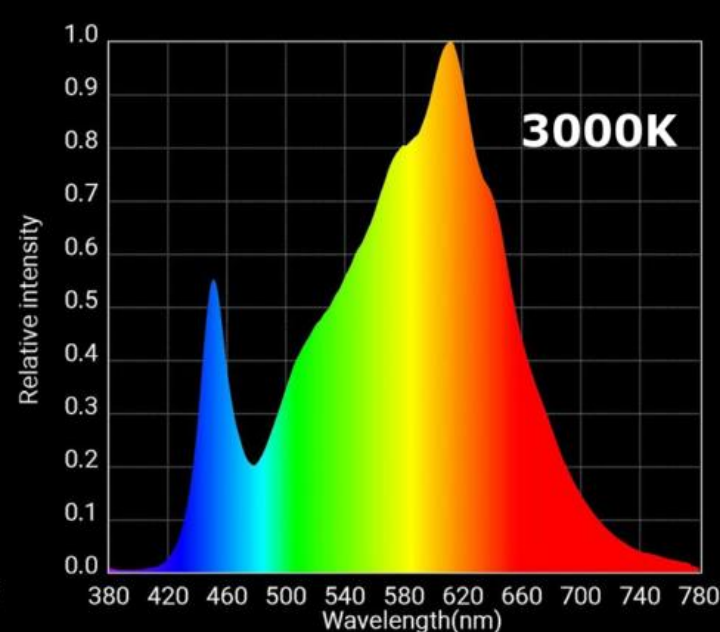
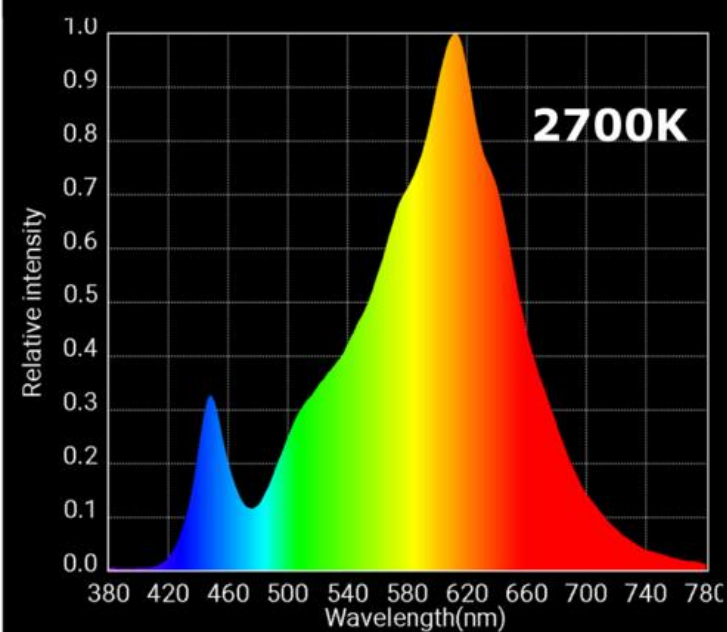


"It flew into the restaurant and landed on a man/table"
-- 5 Palms in Kihei



"Flew into the shop, removed by cleaners"
-- Louis Vuitton in Wailea





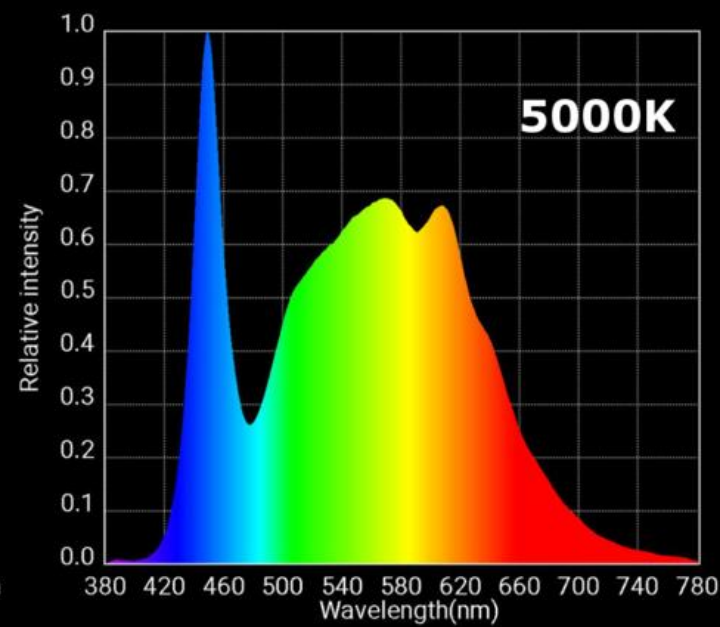
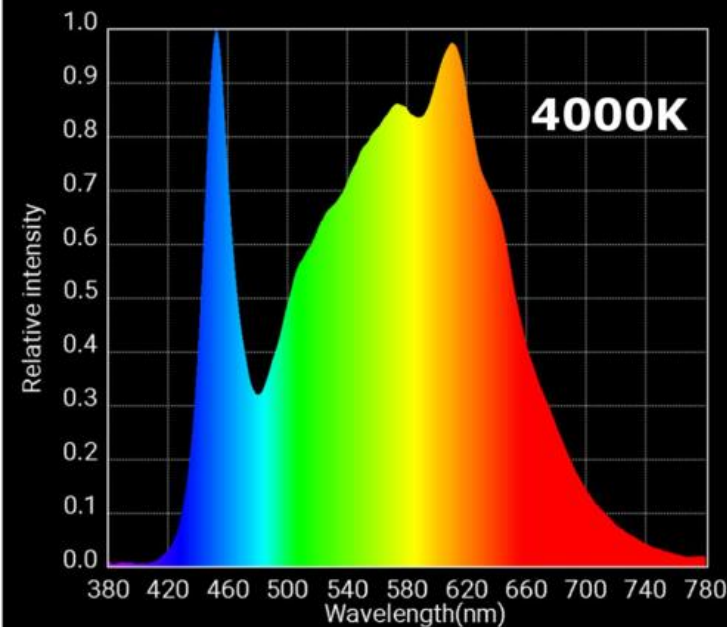
Spectral content of lights by kelvin description

Kelvin is not an accurate representation of the amount of short wavelength light in a light source

We know that reducing the amount of light in the 550 and shorter wave lengths reduces distraction of wildlife.

Our recommendation, if using kelvin, wildlife acceptable is 2200 or lower

"Blue-green light content" means the ratio of the amount of energy emitted by an outdoor light fixture between 350 and 550 nm divided by the amount of energy between 350 and 700 nm – Keep it less than 2%



Most LED luminaires emit no UV and can be configured to limit shorter wavelengths

The **astronomical community** is very clear that **blue light is a problem**

The **human health community** is clear on the **melatonin action spectrum**

The **wildlife advocate community** sees the multiple **negative impacts on numerous species**

Public aesthetics increasingly recognize **unhealthy and unpleasant glare**

We should be doing outdoor lighting in way that doesn't try to replicate the daytime

Zoological Lighting Institute's **model lighting ordinance** for “wildlife-sensitive” areas

No ultraviolet

Keep away from the short wavelengths in almost every circumstance

Total shielding of up-light and good horizontal cutoff

Always shield outdoor lighting away from wetlands and bodies of water

This proposed ordinance goes beyond CCT

Eliminate all wavelengths below 550 nm.