

# The Importance of Dark Skies

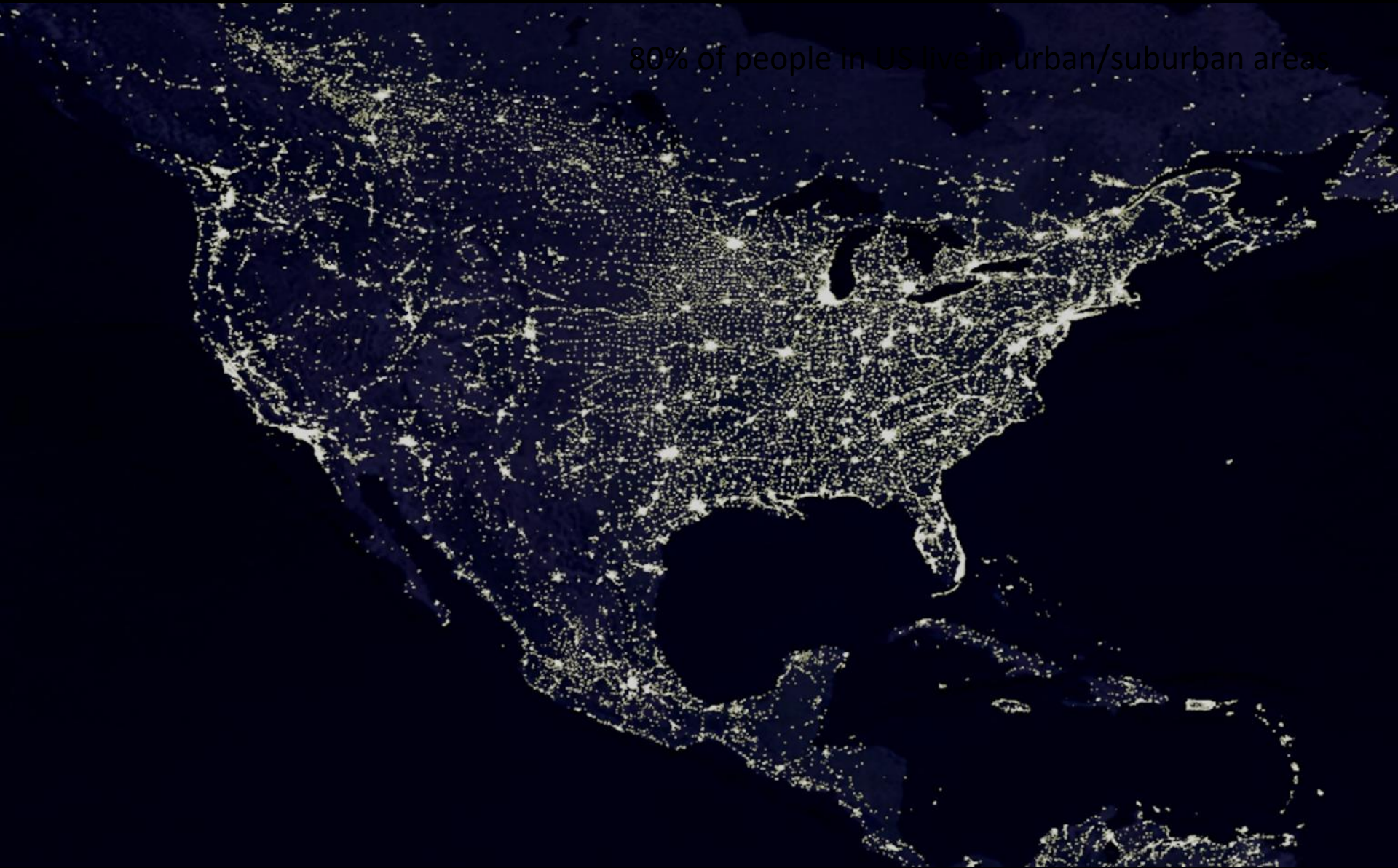
House Committee on Energy & Environment  
Informational Hearing 19 March 2021



INTERNATIONAL DARK-SKY ASSOCIATION  
OREGON CHAPTER

H Mehmedinovic

80% of people in US live in urban/suburban areas











Portland, Salem, Eugene

Bend, Roseburg, Coos Bay, Newport

Yachats, Burns, John Day

Siuslaw NF, Cape Perpetua, Washburn SP

Alvord, Steens, Hart Mtn, Summer Lake

8/9

City/Inner  
City Sky

7

City/  
Suburbia  
Transition

6

Bright  
Suburban  
Sky

5

Suburban  
Sky

4

Suburban/Rural  
Transition

3

Rural Sky

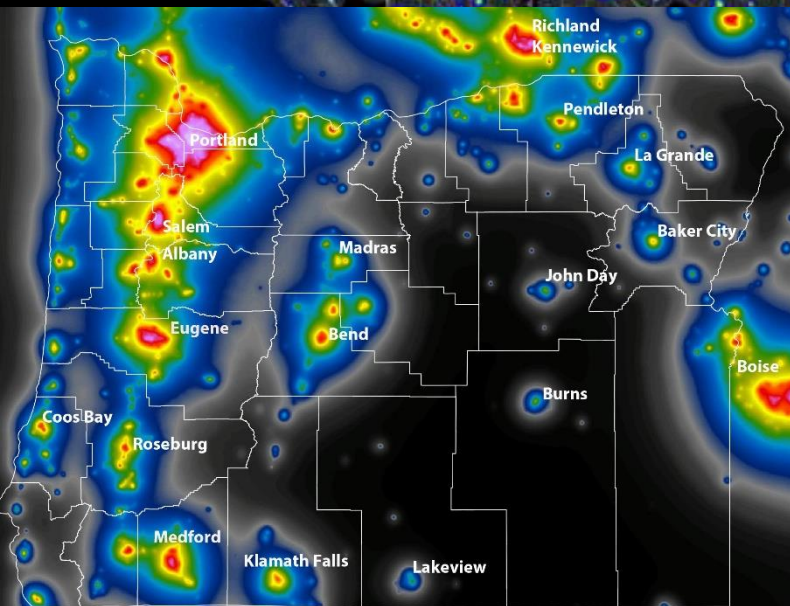
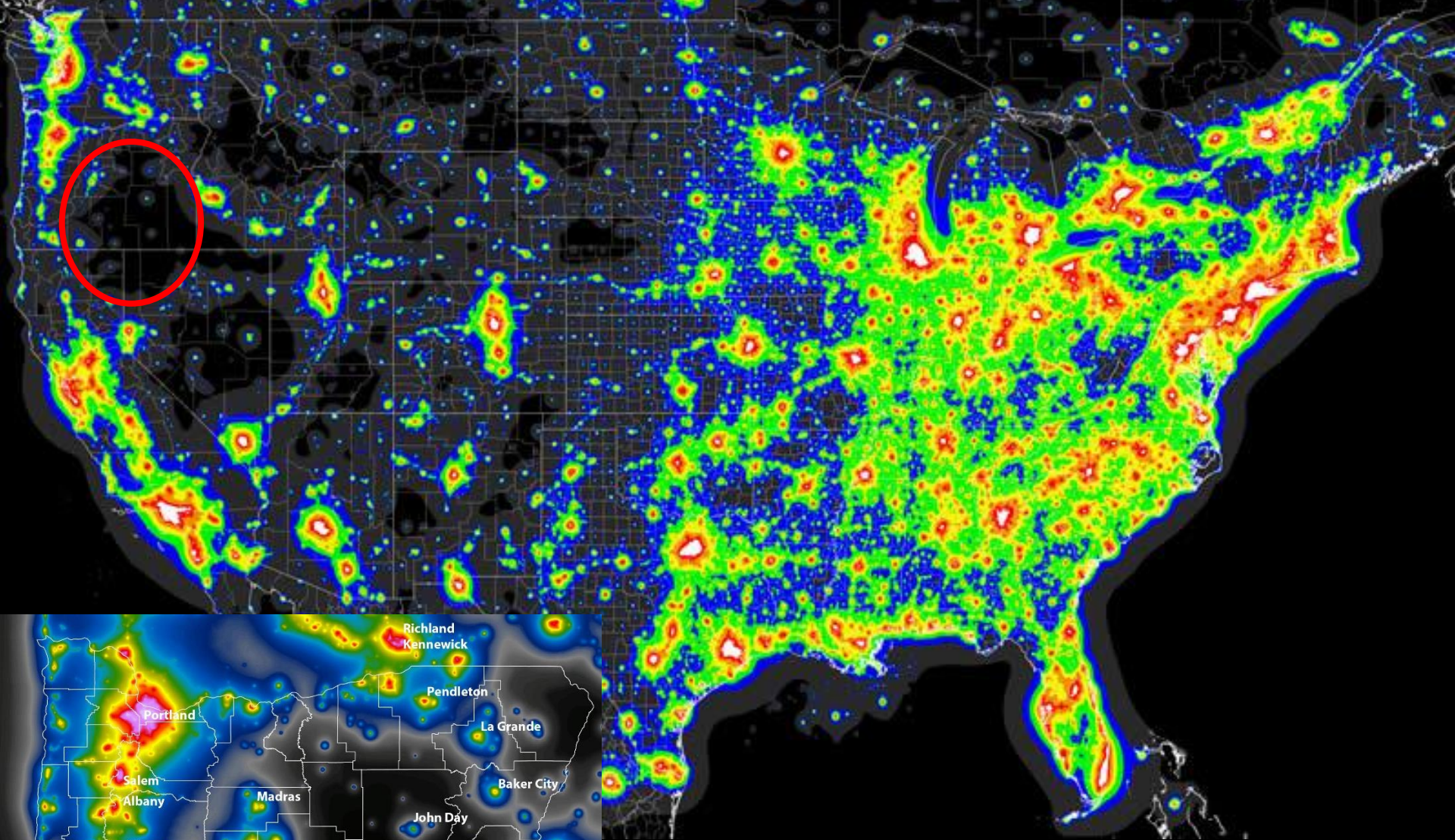
2

Dark-Sky  
Site

1

Excellent  
Dark-Sky  
Site





*New World Atlas of Artificial Night Sky Brightness 2016*

99% of people in US live under light polluted skies  
80% can't see the Milky Way from where they live

## Connecting spectral radiometry of anthropogenic light sources to the visual ecology of organisms

B. M. Seymoure<sup>1,2</sup>, C. Linares<sup>1,2</sup> & J. White<sup>1,2</sup>

<sup>1</sup> Department of Biology, Colorado State University, Fort Collins, CO, USA


<sup>2</sup> Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO, USA

## Artificial light at night causes reproductive failure in clownfish

Emily K. Fobert<sup>1,3</sup>, Karen Burke da Silva<sup>3</sup> and Stephen E. Swearer<sup>1,2</sup>

Research Article | Published: 30 March 2019

## Reducing light pollution improves connectivity for bats in urban landscapes

[Alexis Laforge](#) , [Julie Pauwels](#), [Baptiste Faure](#), [Yves Bas](#), [Christian Kerbiriou](#), [Jocelyn Fonderflick](#) & [Aurélien Besnard](#)

## Mapping the consequences of artificial light at night for intertidal ecosystems

Matthew J. Garratt, Stuart R. Jenkins, Thomas W. Davies \*

Article | Published: 02 November 2020

## A meta-analysis of biological impacts of artificial light at night

[Dirk Sanders](#), [Enric Frago](#), [Rachel Kehoe](#), [Christophe Patterson](#) & [Kevin J. Gaston](#) 

Open Access | Published: 04 September 2015

## Light pollution disrupts sleep in free-living animals

[Thomas Raap](#), [Rianne Pinxten](#) & [Marcel Eens](#)

## Light pollution is greatest within migration passage areas for nocturnally-migrating birds around the world

[Sergio A. Cabrera-Cruz](#), [Jaclyn A. Smolinsky](#) & [Jeffrey J. Buler](#)

[Cite this article](#)

## Light pollution hampers recolonization of revitalised European Nightjar habitats in the Valais (Swiss Alps)

Antoine Sierro<sup>1</sup>  · [Andreas Erhardt](#)<sup>2</sup>

## Nocturnal flight-calling behaviour predicts vulnerability to artificial light in migratory birds

[Benjamin M. Winger](#), [Brian C. Weeks](#), [Andrew Farnsworth](#), [Andrew W. Jones](#), [Mary Hennen](#) and [David E. Willard](#)

[Handbook of Advanced Lighting Technology](#) pp 1-33 | [Cite as](#)

## Impact of Lighting on Flora and Fauna

Authors

[Authors and affiliations](#)

[Sibylle Schroer](#) , [Franz Hölker](#)

ARTICLE

<https://doi.org/10.1038/s42003-019-0548-6>

OPEN

Sustainability of coral reefs are affected by ecological light pollution in the Gulf of Aqaba/Eilat

[Yael Rosenberg](#) , [Tirza Doniger](#)  & [Oren Levy](#)<sup>1</sup>

## Artificial light at night confounds broad-scale habitat use by migrating birds

What is the available evidence that artificial light at night affects animal behaviour?  
A systematic map protocol

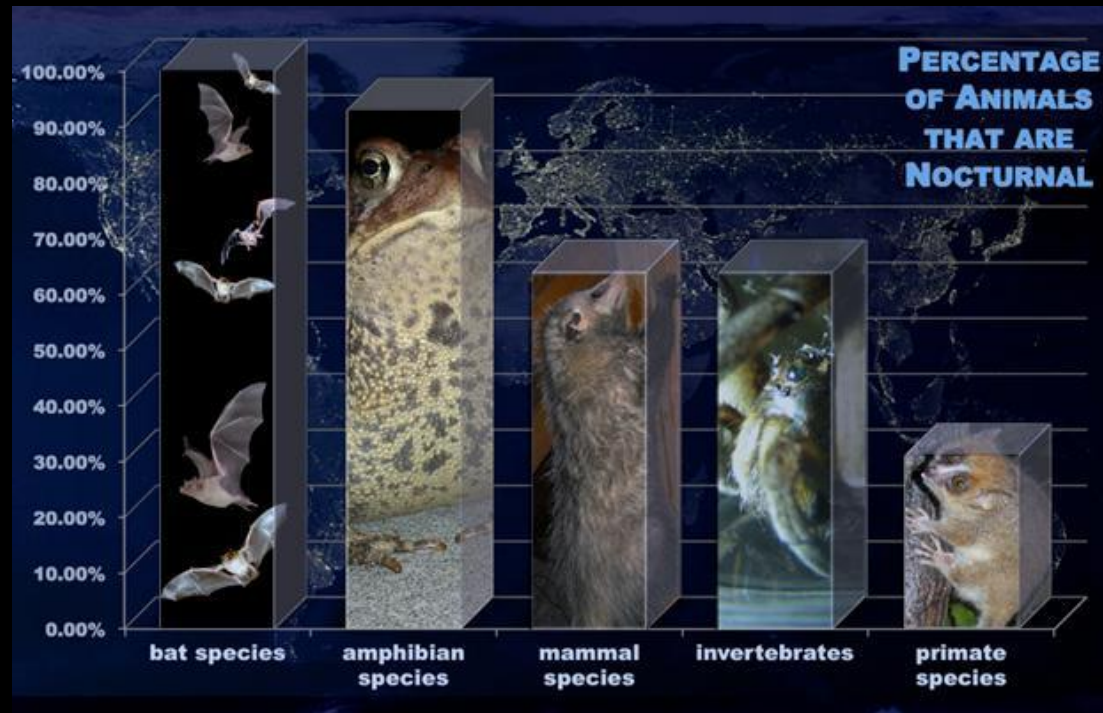
[Lucy Katherine McLay](#)<sup>1\*</sup> , [Juhani Peter Hopkins](#)<sup>2</sup>, [Bob Bern Ming Wong](#)<sup>3</sup>, [Ulrika Candolin](#)<sup>4</sup> and [Therésa Melanie Jones](#)<sup>1</sup>

## Light pollution increases West Nile virus competence of a ubiquitous passerine reservoir species

[Meredith E. Kernbach](#)<sup>1</sup>, [Daniel J. Newhouse](#)<sup>3</sup>, [Jeanette M. Miller](#)<sup>1</sup>, [Richard J. Hall](#)<sup>4</sup>, [Justin Gibbons](#)<sup>1,2</sup>, [Jenna Oberstaller](#)<sup>1</sup>, [Daniel Selechnik](#)<sup>5</sup>, [Rays H. Y. Jiang](#)<sup>1</sup>, [Thomas R. Unnasch](#)<sup>1</sup>, [Christopher N. Balakrishnan](#)<sup>3</sup> and [Lynn B. Martin](#)<sup>1</sup>



# Ecological Light Pollution



**Artificial light at night is not benign.**

- Confuse celestial navigation – BIRD MIGRATION
- Cause disorientation/misorientation -- SEA TURTLES
- Result in attraction/repulsion behaviors –BATS
- Impact predator/prey relationships – OWLS AND PREY
- Interrupt circadian rhythms that govern timing of breeding, nesting, migration, foraging



Standard Insurance Building Galveston TX, May 2017: 398 birds collided with building





Nearly 30% of birds in U.S., Canada have  
vanished since 1970

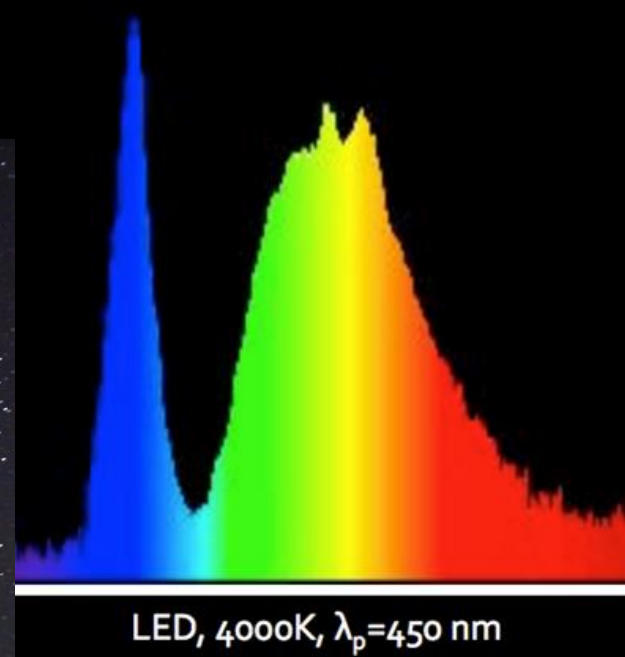




# Human Health Impacts

Excessive exposure to ambient light at night is a well-documented hazard to human health

- AMA 2009--adopted resolution advocating for light pollution legislation
- AMA 2016--report on Blue-rich white light and risk of cancer, diabetes, CV disease
- CDC: insufficient sleep is linked to the development of type-2 diabetes, CV disease and depression
- Stanford Sleep Epidemiology Lab (2016):  
*Artificial Outdoor Nighttime Lights Associate with Altered Sleep Behavior in the American General Population*
- Glare--hazardous for drivers, cyclist, pedestrians





# Equity | Environmental Justice

## Cross sectional association between outdoor artificial light at night and sleep duration in middle to older aged adults (Xiao et al 2019)

- *Higher levels of ALAN were associated with both very short and short sleep*
- *Associations between ALAN and short sleep were larger in neighborhoods with higher levels of poverty*
- *Future studies should investigate the potential benefits of reducing light intensity in high ALAN areas to improve sleep health*

## Light pollution inequities in the continental United States: A distributive environmental justice analysis (Nadybal et al 2020)

- *Found disparities in exposures to LP based on racial/ethnic minority and low-to-mid socioeconomic statuses.*
- *Asian, Hispanic or Black Americans had mean exposures to light pollution in their neighborhoods that were approximately two times that of White Americans;*
- *Neighborhoods with higher proportions of Black/Hispanic/Asian-Americans, or renter-occupants experienced greater exposures to ambient light at night.*
- *Analyses indicated patterns of inequity similar across urban-rural context.*

## Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas (Hoffman et al 2020)

- *Historical racist redlining policies have resulted in long term disinvestment in historically black neighborhoods;*
- *Homeowner's Loan Corporation (HOLC) used scoring system: A-most desirable, D-most hazardous;*
- *HOLC-rated "hazardous" neighborhoods today have higher impervious surface area and less tree canopy;*
- *Avg 5 degree difference in ambient temp between A and D neighborhoods nationwide, and up to 20 degree difference between some neighborhoods in a single city on a single day.*

*\*Lack of tree canopy in historically redlined neighborhoods as well as general lack of landscaping in multifamily residential likely increases streetlight impacts on sleep quality*



- About 35% of **light is wasted** (unshielded and/or poorly aimed)
- \$3 Billion/year of energy lost
- 15 Million tons/year of CO<sub>2</sub> emissions



# Lighting Design – Public Safety

Brighter does not mean safer (National Institute of Justice, 1997)

- Overly bright lighting = deep, sharp shadows (opp's for concealment)
- Bright lighting impairs night vision
- Most property crime committed during day, or inside lit buildings



We do not have to choose between safety, security and access to the night sky.

# Best Practices-IDA/IES

## LIGHT TO PROTECT THE NIGHT

Five Principles for Responsible Outdoor Lighting



**Illuminating**  
ENGINEERING SOCIETY



### USEFUL



#### ALL LIGHT SHOULD HAVE A CLEAR PURPOSE

Before installing or replacing a light, determine if light is needed. Consider how the use of light will impact the area, including wildlife and the environment. Consider using reflective paints or self-luminous markers for signs, curbs, and steps to reduce the need for permanently installed outdoor lighting.

### TARGETED



#### LIGHT SHOULD BE DIRECTED ONLY TO WHERE 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.

### LOW LIGHT LEVELS



#### 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.

### CONTROLLED



#### LIGHT SHOULD BE USED ONLY WHEN IT IS USEFUL

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.

### COLOR

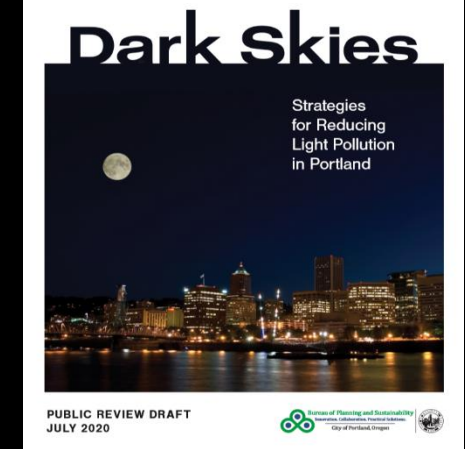


#### USE WARMER COLOR LIGHTS WHERE POSSIBLE

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

1. Minimize unnecessary lighting
  2. Fully shielded, aimed down
  3. Limit total brightness (lumens)
  4. Use adaptive controls: motion sensors or dimmers
- 
1. Choose Warm Color!  
Color temp <3,000 K





## Oregon Cities with laws to reduce LP:

- Beaverton
- Bend
- Cannon Beach
- Corvallis
- Hillsboro
- Lake Oswego
- Milwaukie
- Oregon City
- Port Orford
- River Grove
- Sandy
- Seaside
- Sisters
- Troutdale
- Tualatin
- West Linn
- Wilsonville
- Yachats \*

### Oregon Counties:

- Multnomah
- Washington
- Clatsop
- Deschutes

## States that have taken action on LP:

- Arizona
- Arkansas
- **California-Lighting Zones as part of Energy Code**
- Colorado
- Connecticut
- Delaware
- Florida
- Hawaii
- Maine
- Maryland
- Minnesota
- New Hampshire
- New Mexico-Applies to municipalities
- New York
- **Oregon \* 2010, shielded fixtures public buildings**
- Rhode Island
- Texas
- Virginia
- Wyoming
- DC

# World Class Night Skies

TRAVEL SOUTHERN OREGON

THINGS TO DO PLACES TO GO CRATER LAKE STORIES VISITOR RESOURCES

**Discover the Night**

**OREGON OUTBACK DARK SKY NETWORK ON FACEBOOK!**

Check for upcoming events, post photos, share posts and find Dark Sky friends on the ODSN Facebook Page.

**INTERNATIONAL DARK SKY WEEK**  
APRIL 5-12, 2021

The IDA kicks off this night sky celebration in just a few days! In honor of this annual event, we have launched a [website](#) where you will find a snapshot of the people and places working to protect the night in the global dark sky movement. There are also over 70 [events](#), and the list is growing. Learn about astrophotography, why wildlife needs the dark, or attend a star party! Many of these events are virtual, allowing you to connect from anywhere.

**Oregon Outback Dark Sky Network**

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US

**The ultimate Pacific Northwest stargazing road trip**

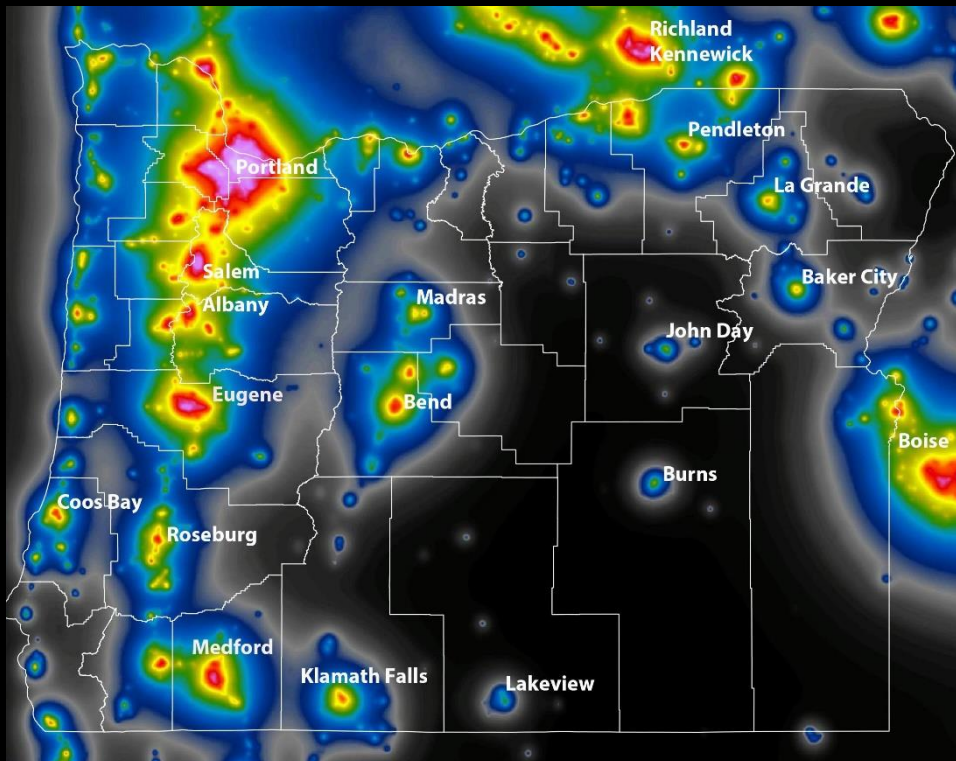
These celestial stops will offer you some of the best views of the night sky

9 34:04 1,797 mi \$343

Things To Do » Trip Ideas » Favorite Trips » 7 Otherworldly Stargazing Spots

**7 OTHERWORLDLY STARGAZING SPOTS**

JD Shadel, Author  
Ben Canales, Photographer  
May 22, 2016 (Updated June 17, 2019)



- Portland Audubon
- Oregon Audubon Chapter Network (11)
- Rose City Astronomers
- Oregon IDA
- Oregon Parks and Recreation
- Portland Parks & Recreation
- Travel Southern Oregon
- Basin & Range Dark Sky Collaborative
- Sunriver NC & Observatory