Better Lighting Panel Discussion

Planning and Environmental Committee - Sunset Valley

Dawn Davies, Night Sky Program Manager

8 March 2023

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Hill Country Alliance and the Night Sky

HCA works with community partners to reduce light pollution, establish better practices, and celebrate the dark night sky through:

- Education
  - Light Pollution
  - Night Sky Friendly Lighting
  - Hill Country Night Sky Month
- Friends of the Night Sky Groups
- Ordinances and Resolutions
- Projects & Mapping

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Four out of five North Americans have lost the view of the Milky Way where they live.
(The New World Atlas of artificial night sky brightness, *Science Advances*, 10 June 2016: Vol.2, no. 6)

Light pollution has adverse effects across a multitude of areas.

Night Sky: Heritage, culture, wonder

Wildlife: Insects, birds, mammals, ecosystems

Human Health: Sleep disorders, metabolism, cancer

Crime: Leads criminals to targets, decreases visibility

Traffic: Decreases visibility

Finance: Wasted electricity, lost tourism opportunity

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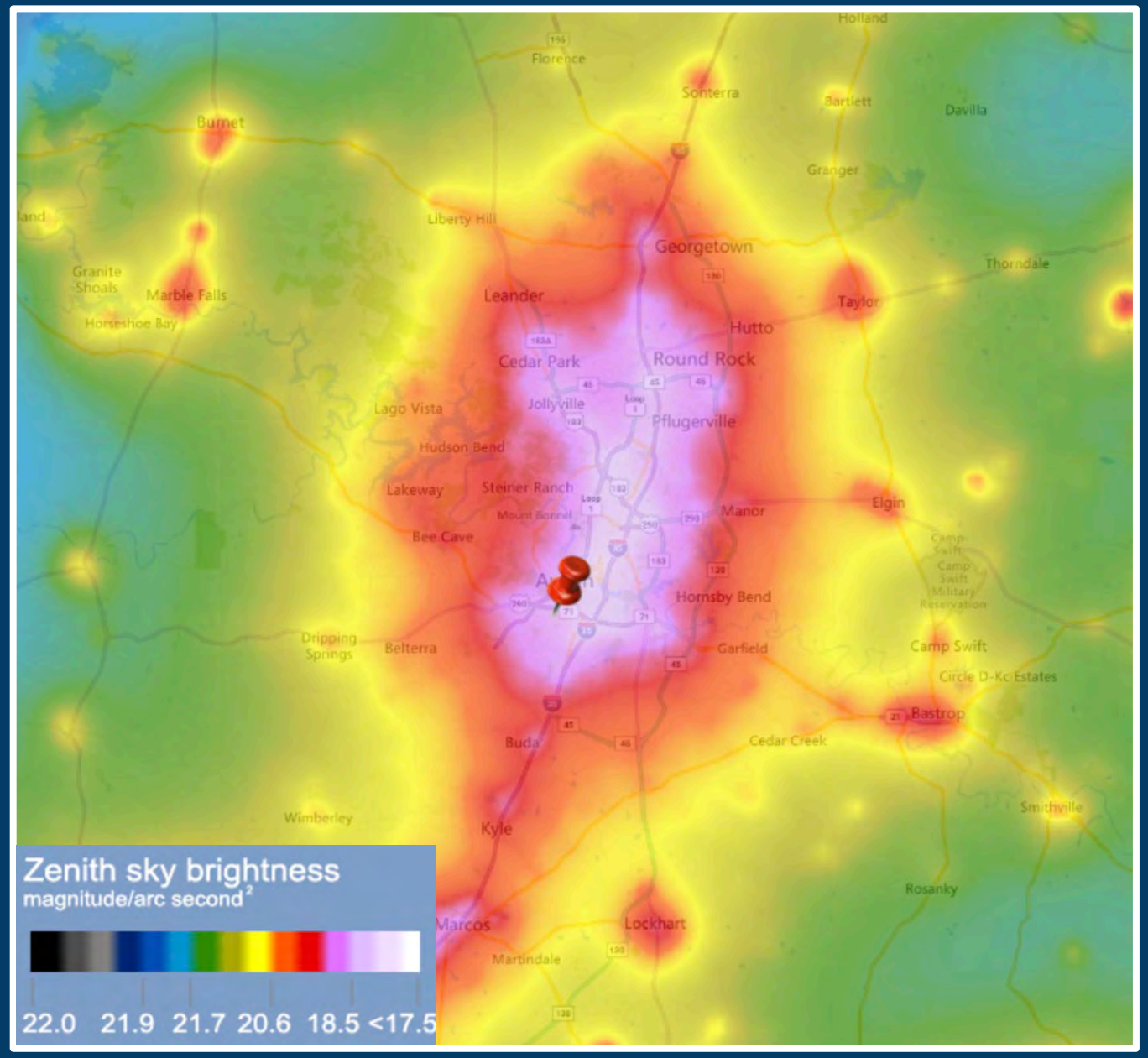

Lightpollutionmap.info

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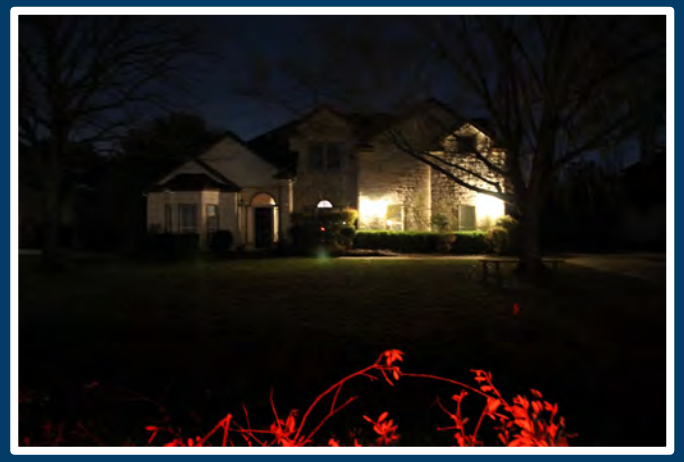
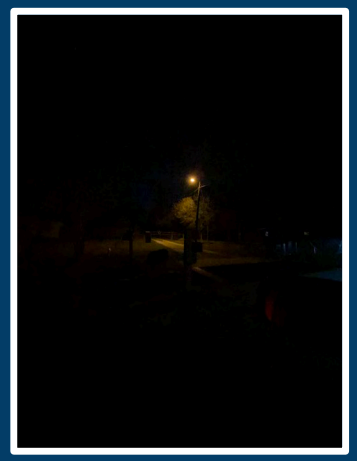
Sunset Valley – Residential Neighborhoods









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Sunset Valley Village

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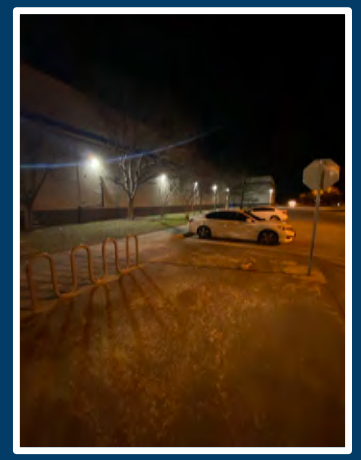
Sunset Valley Marketfair



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Sunset Valley Homestead

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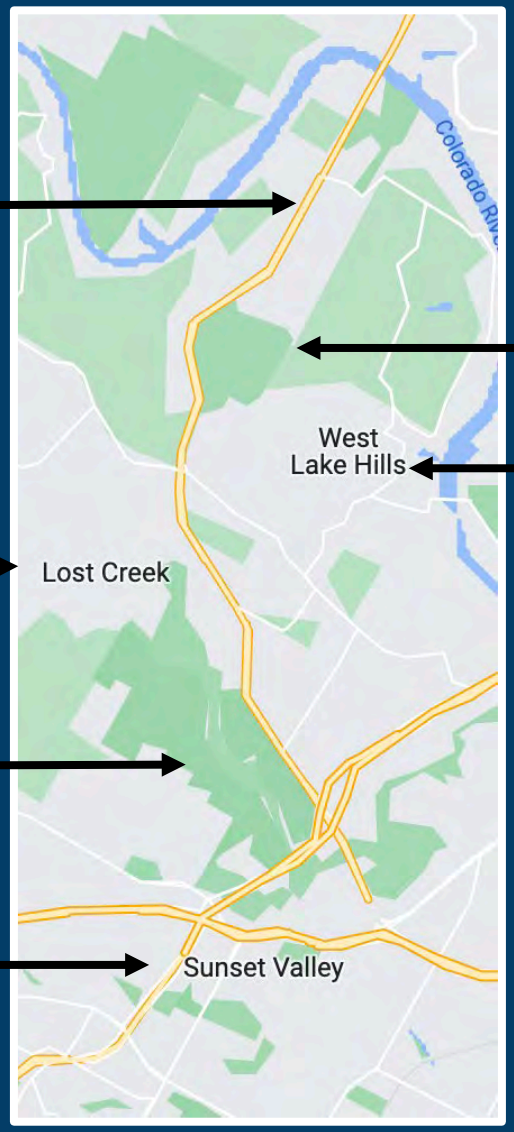
North Capital of Texas Highway 360 Project

St. Stephen's Episcopal School

Lost Creek Neighborhood

Barton Creek Wilderness Park

Sunset Valley



Wild Basin Nature Preserve

West Lake Hills

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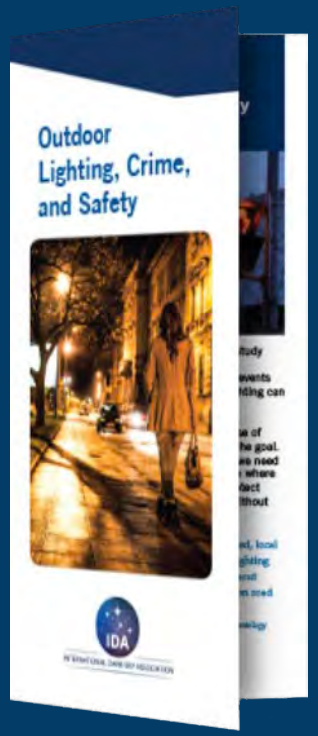
The Human Factor

Night sky advocates and the American Medical Association agree that light pollution is bad for your health. Both support the use of LED fixtures for their energy saving and financial benefits. However, the culprit lies in bulbs that emit light along the blue portion of the color spectrum. The higher the color temperature of a bulb, in excess of 3000K, the greater the level of blue light emissions. Regular and excessive exposure at night to blue light leads to:

- decreased levels of melatonin
- circadian rhythm disruption
- impaired daytime function
- greater incidence of obesity and diabetes
- increased risk of cancer
- Increased risk of cardiovascular disease

More Light Doesn't = More Safe

An area of contention that exists is that the more outdoor light on a home or business, the safer those structures are. This only holds true if the fixtures are night-sky-friendly. The enemy of crime and safety is not lack of light, it is glare.



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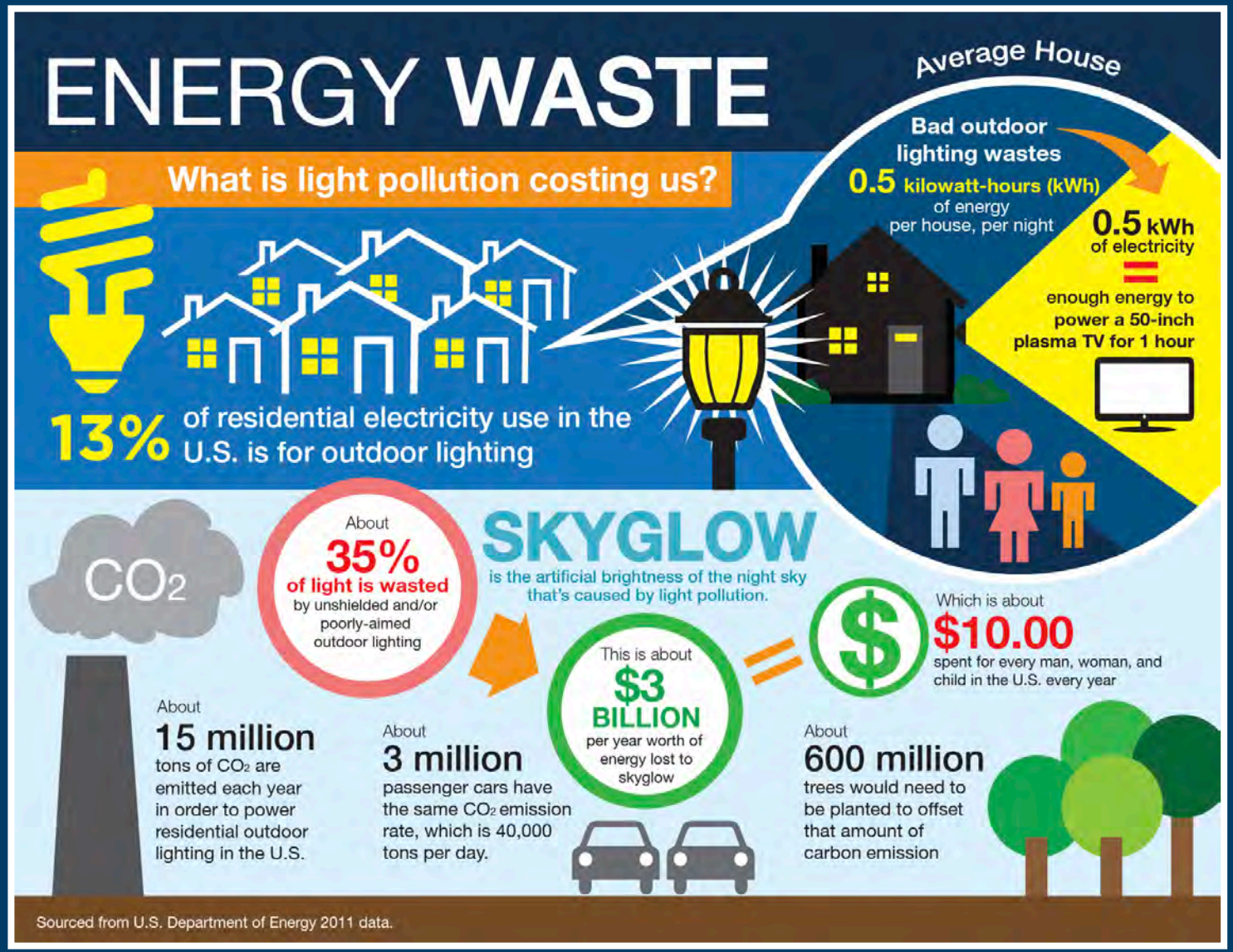
Money and Energy Waste

Light pollution costs the United States approximately $3 billion in energy loss and is responsible for 15 million tons in CO_2 emissions each year. The State of Texas loses around $250 million, and light pollution in the Hill Country alone is to blame for roughly 21k tons of CO_2 emissions annually.



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Texas Blind Salamander

© TPWD

Texas Snowbell

© Jackie Poole - TPWD

Sharpnose Shiner

© Chad THomas

Barton Springs Salamander

© Ryan Hagerty/USFWS

Texas Wild Rice

© John Thomaides

Fountain Darter

© USFWS

Austin Blind Salamander

© Matthew Moskwik

Peck's Cave Amphipod

© Joe Fries, USFWS

Comal Springs Dryopid Beetle

© USFWS

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Nature Threatened

Every animal and plant species is affected in one way or another by light pollution. The Texas Hill Country is home to nine species that are not only at risk from artificial outdoor light, but they are also endemic to the region and critically endangered.

Texas Hill Country
Dark Sky Quality Analysis

Created by Amy Jackson, Starry Sky Austin for ACC GIS Capstone Project in Collaboration with the Hill Country Alliance. May 18, 2019.

Introduction:
The practice of lighting up our night sky decreases the visibility of our stars and our own galaxy, the Milky way. Light pollution not only affects dark sky quality, but also has a large impact on the health of humans, plants and wildlife and wastes billions of dollars every year. The picture below shows the World Atlas of Artificial Night Sky Brightness.

Fig. 1 World Atlas of Artificial Sky Brightness

Most of our planet's population live in urban areas and so are inundated by light pollution. Effort is underway between the City of Austin, Travis County, the Texas chapter of the International Dark Sky Association and local interest groups, such as the Hill Country Alliance, to eradicate light pollution for surrounding communities and Austin, TX. Understanding the impact of light pollution for the state of Texas will help to bring about awareness which will inspire collective action. This collective action, in time, will increase the need for night sky lighting ordinances and change laws and practices for cities and communities throughout the state.

The Hill Country Alliance is a non-profit organization focused on conservation of the Texas Hill Country. One of their main focus areas for conservation is dark skies. In collaboration with the Hill Country Alliance Dark Sky team, this project is focused on answering two questions, "What is the dark sky quality of the state of Texas and the Texas Hill Country 18 county region?" The results of this analysis will aid in the Hill Country Alliances assessment of dark sky quality in order to communicate the need for change in current practices and focus conservation efforts for this 18 county region

Methodology:
This project used two main datasets to analyze dark sky quality for Texas and the hill country 18 county region. 1) Floating point data used to make the World Atlas of Artificial Night Sky Brightness, produced by the Light Pollution Science and Technology Institute (ISTIL), and described in the paper "The New World Atlas of Artificial Night Sky Brightness" (Falchi et al. 2016) and 2) Texas Political Boundaries data. The end goal was a Texas Overall Dark Sky Quality map and a Texas Hill Country Dark Sky Quality map of the 18 country region specified by the Hill Country Alliance.

It was necessary to determine criteria for dark sky quality ratings. We based dark sky quality criteria using: 1) the World Atlas of Artificial Sky Brightness shown in Fig.1 2) the Sky Brightness Nomogram, shown in Fig. 2, from the International Dark Skies Task Group of the National Optical Astronomical Observatory.

Fig. 2 National Optical Astronomy Observatory Fig.3. IDA

3) the Bortle Scale, shown in Fig. 3 and 4) our knowledge of the night sky quality in given areas.

The following table summarizes the dark sky quality criteria we determined for symbolizing and reclassifying pixel values from the World Atlas of Artificial Sky Brightness floating point data.

Fig. 4 Dark Sky Quality Table

Dark Excellent skies correspond to some of the darkest skies in Texas. At this level of dark sky quality, you can see the summer Milky Way and the winter Milky Way which is fainter than in summer. These skies are dark with minimal domes of light on the horizon. Fainter stars are visible.

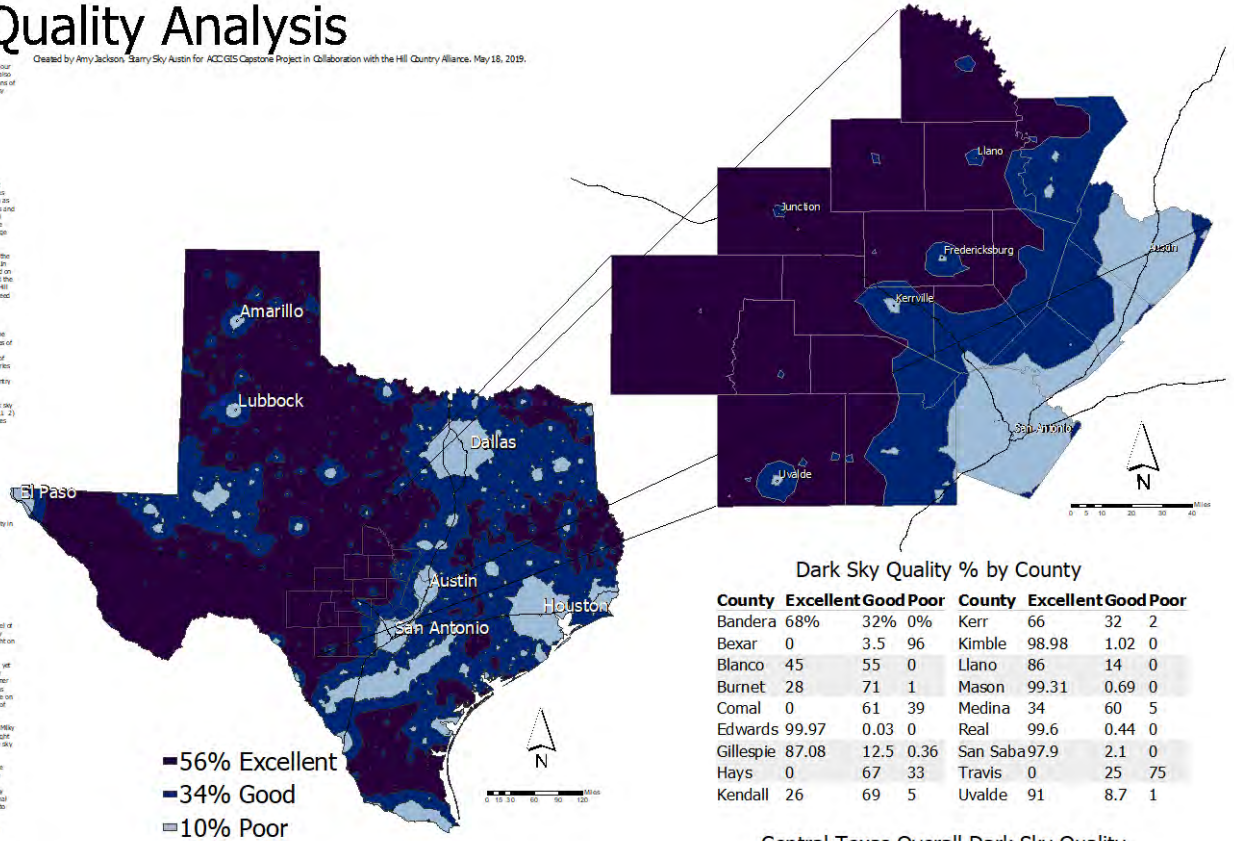
Dark Good skies correspond to seeing the winter and the summer Milky Way, yet the structure of the Milky Way will not be as brilliant as in an 'Excellent' dark sky quality area. A lesser amount of faint stars are visible on the horizon. The summer Milky Way is slightly visible when overhead but lacks in any detailed structure. As you get closer to the boundary between 'Good' and 'Poor', light domes are visible on the horizon if you are viewing from an area near urban centers which are areas of high light pollution

Poor skies correspond to a lack of visibility for the winter and summer Milky Way. Close to city centers where light pollution is high, the sky is glowing with light and so people living in these areas may never experience a 'true night' since the sky is in a state of 'artificial twilight'.

The World Atlas raster layer was symbolized using manual intervals based on the Dark Sky Quality Criteria Table shown in Fig. 4. I then made a reclassified raster based on this symbology and used the 'raster to polygon' geoprocessing tool to make polygon feature classes from the raster. I conducted an overlay analysis by using the 'intersect' geoprocessing tool to overlay the tile state of Texas polygonal feature class and the Central Texas 18 county region of interest feature classes to determine Dark Sky Quality based on the criteria table in Fig. 4.

After joining data tables for the state of Texas and Central Texas, I determined percentages of each category of dark sky quality, 'excellent', 'good' and 'poor'.

It looks like Texas is doing pretty well maintaining dark skies, however, by looking at the map, you can see that most of the light polluted areas with poor dark sky quality occurs in urban centers. Most people all over the world live in urban centers, so even though dark sky quality may be mostly excellent, who gets to see these night skies and how far will people have to travel to see a truly excellent, dark night sky? Growth in Texas, especially central Texas, in particular Austin, is increasing dramatically. Will this map look different in 3 years? It depends on how we value our night sky and what we do to change our lighting practices in our urban centers and beyond.



Dark Sky Quality % by County

County	Excellent	Good	Poor	County	Excellent	Good	Poor
Bandera	68%	32%	0%	Kerr	66	32	2
Bexar	0	3.5	96	Kimble	98.98	1.02	0
Blanco	45	55	0	Llano	86	14	0
Burnet	28	71	1	Mason	99.31	0.69	0
Comal	0	61	39	Medina	34	60	5
Edwards	99.97	0.03	0	Real	99.6	0.44	0
Gillespie	87.08	12.5	0.36	San Saba	97.9	2.1	0
Hays	0	67	33	Travis	0	25	75
Kendall	26	69	5	Uvalde	91	8.7	1

Central Texas Overall Dark Sky Quality

62% Excellent 24% Good 14% Poor

The Disappearance of Night

Up until 2023 it was believed that we were losing our night skies at a rate of 2% annually. Recent reports have proven otherwise. Light pollution from outdoor artificial fixtures is causing a 10% loss of night every year. However, despite the rapid increase, it is still one of the simplest and least expensive types of pollution that exists.

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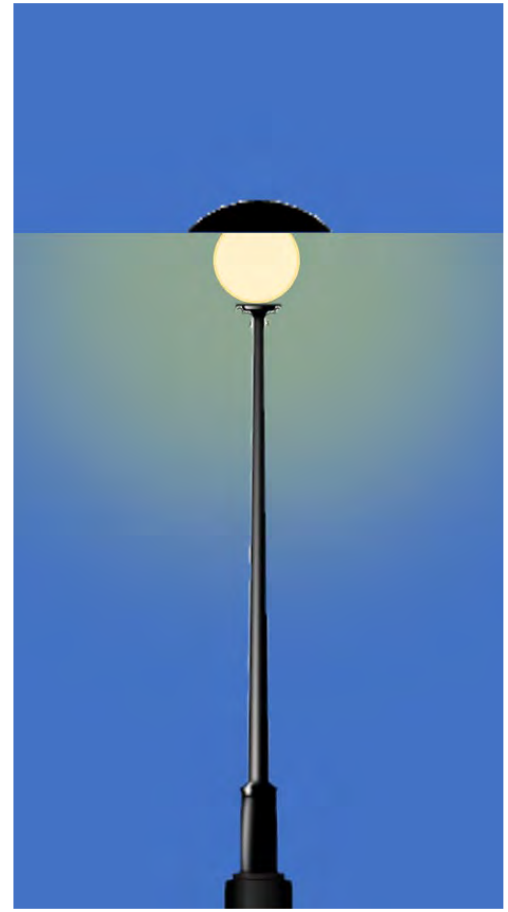
BAD

GOOD

BETTER



BEST

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Night Sky Preservation Starts at Home

Ensure your outdoor lights are:

- Fully shielded
- Shine only what needs illumination
- A temperature of 3000K or lower

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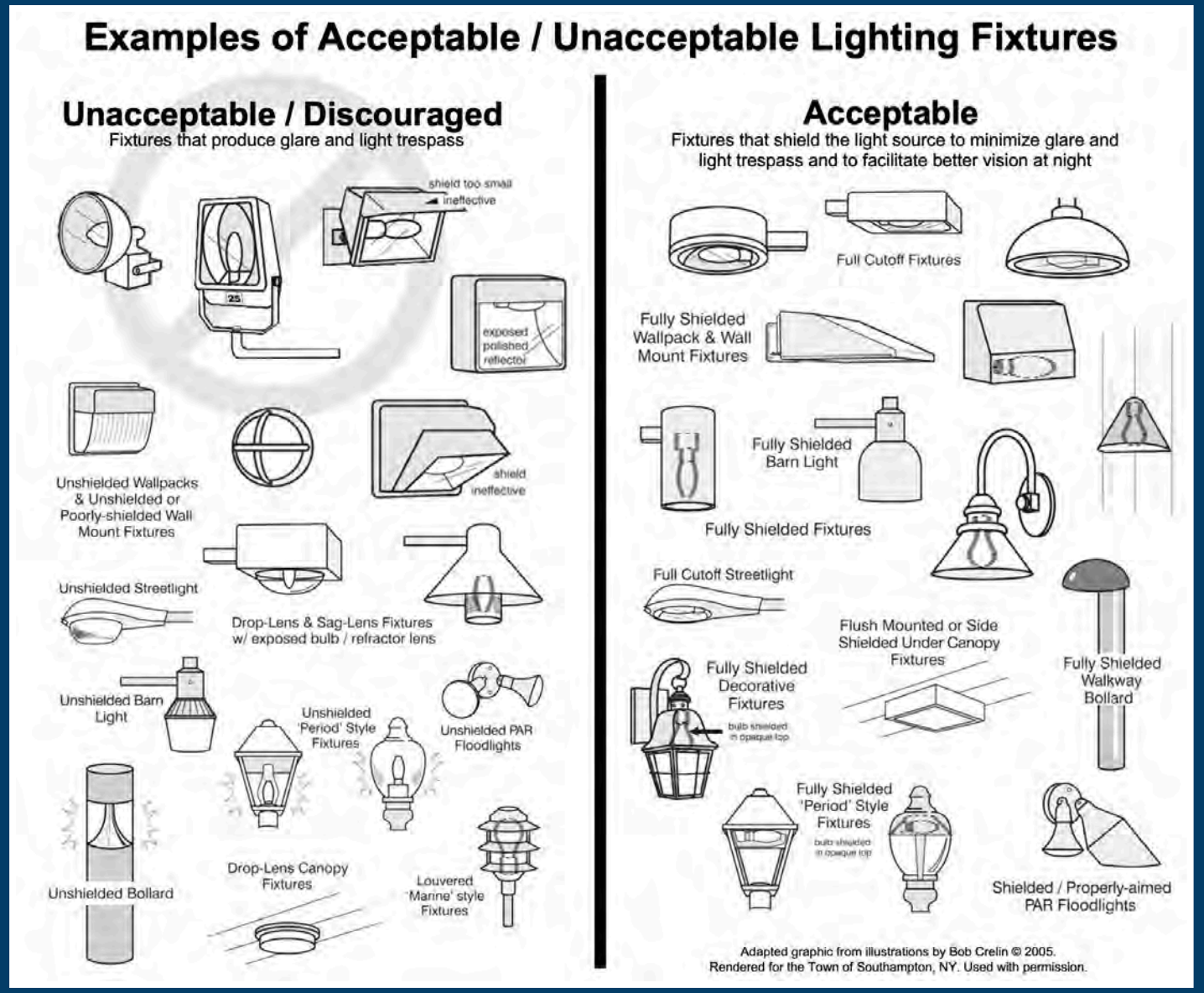


Thank You
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