

Better Lights for Starry Nights



DARK SKIES & HILL COUNTRY ALLURE

Population growth inside Texas cities and along major transportation corridors has led to an explosion of light pollution within the last few decades. The effects of light pollution - glare, sky glow, and clutter - mask the night sky making it difficult to see stars. The NASA imagery which the attached diagram is based upon shows that over half of Texas' sky is polluted with light to the point where visitors and residents can no longer see the magic of the Milky Way painting the sky above at night.

The Hill Country is one of the few remaining regions where residents and visitors can still have a clear view of the night sky. An emphasis should be placed on patterns of growth that will preserve this valuable asset for generations to come.

RECOGNIZING THE PROBLEM

Light Pollution - Excessive and inappropriate artificial light.

Urban Sky Glow - The brightness of the sky over cities.

Light Trespass - Light falling where it is not intended, wanted, or needed.

Glare - Excessive brightness which causes visual discomfort.

Clutter - Bright, confusing, and excessive groupings of light sources commonly found in over-lit urban areas.

LEGEND:

LIGHT POLLUTION TRANSECT



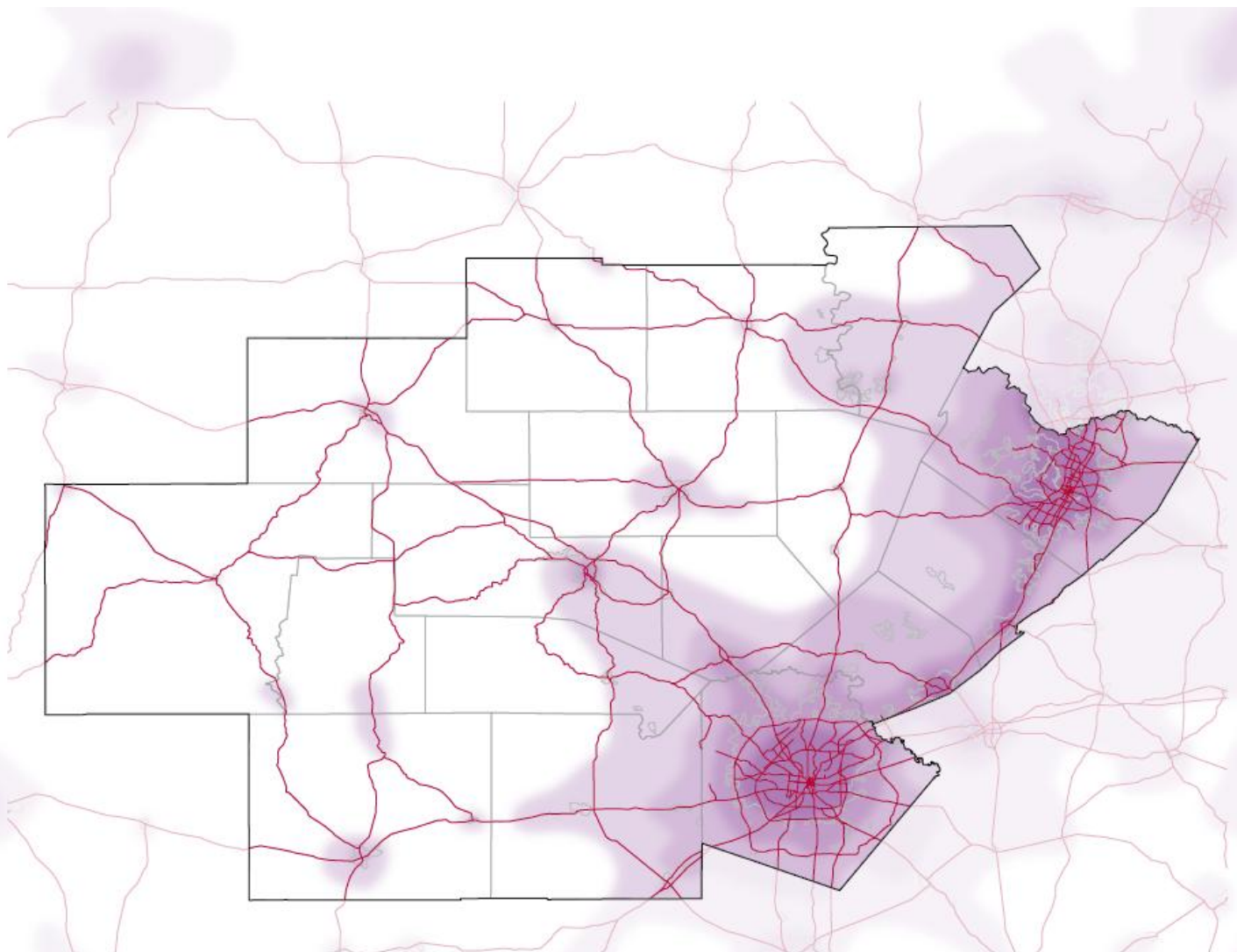
NOT TO SCALE

TUFLAB FALL 2014

A CASE STUDY IN THE TEXAS HILL COUNTRY



JOHNSON CITY



WHY IS THIS IMPORTANT?

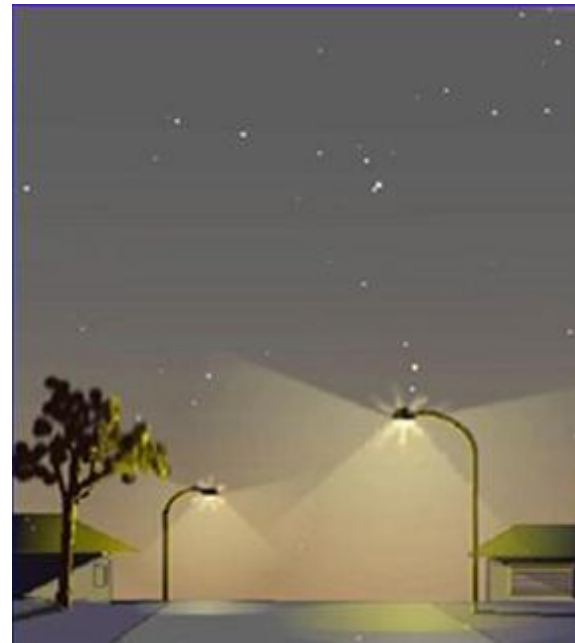
- Wasted Energy/wasted money
- Safety
- Wildlife
- Health
- Sense of place
- The beauty of the heavens



Energy: *Light in the wrong place, is light wasted*



VS.



- Better directed light means less wattage needed
- Wasted outdoor lighting, that shines directly upward, is estimated at 17,400 gigawatt-hours a year.
- At an average of \$.10 per kilo watt-hour the cost of that wasted energy is \$1.74 billion a year.

Safety: Poor lighting can give a false sense of security

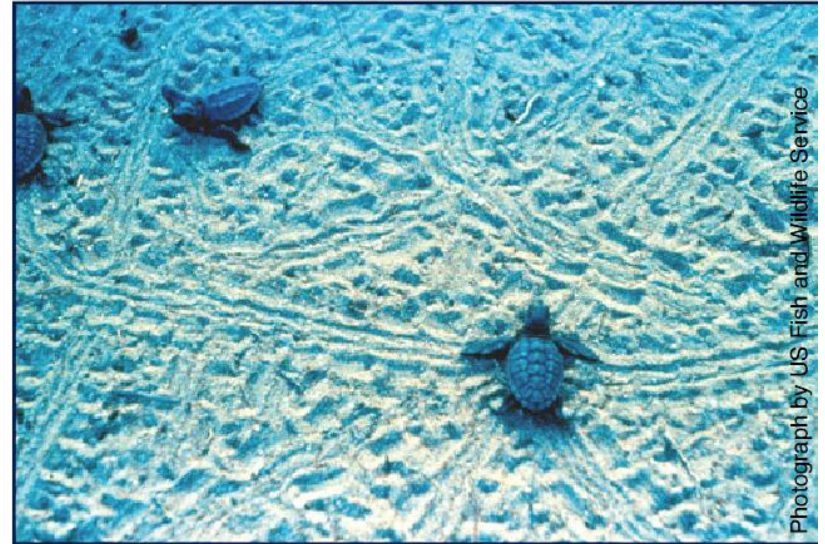


VS.



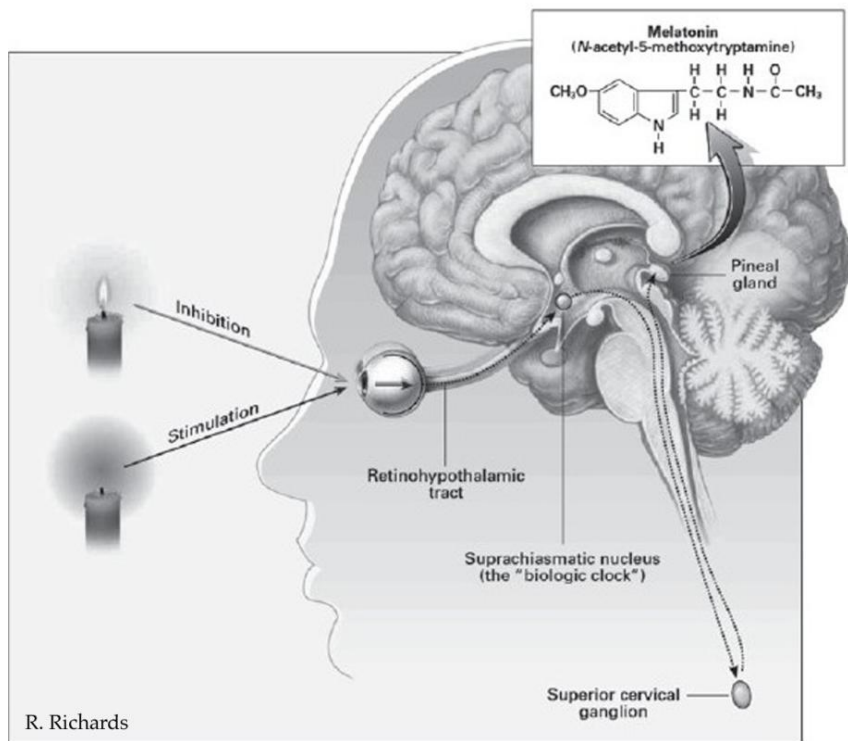
- “If lots of light gave good security, then our cities would be the safest in the world”
- High-glare lighting can make for dangerous driving conditions (think about high-beams vs. low-beams)

Wildlife: *Unnatural lighting impacts natural cycles and behaviors*



- Unnatural light at night can disrupt breeding and feeding
- Migratory patterns of birds and insects can be severely impacted
- Large scale impact on the greater ecosystem

Health: *It's awfully hard to sleep when somebody leaves the lights on!*



- Melatonin is a hormone that is released by darkness and inhibited by light
- It regulates the daily cycles of our mind and body—specifically: *sleep*.
- A lack of sleep can lead to:
 - Weight gain
 - Stress
 - Depression
 - Diabetes
- Shorter wavelengths of light (blue vs. red) have been shown to have a greater negative impact.

What if our grandchildren never got to see this?



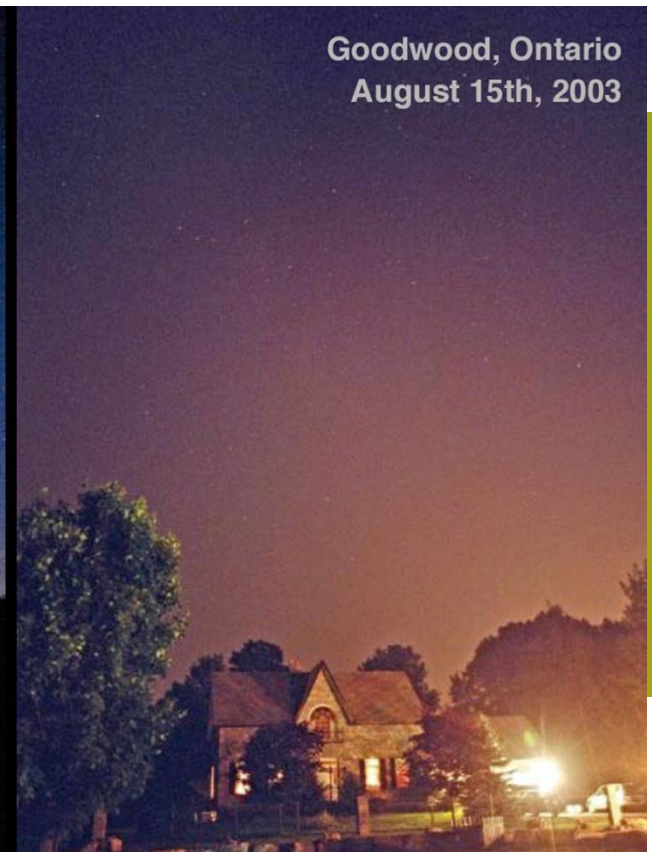
Milky Way over Pedernales Falls State Park

Photo credit: Christopher V. Sherman

- Aside from its awe-inspiring beauty, the night sky constantly informs our sense of place and time of year.

The fundamentals of light pollution

- Urban sky glow
- Glare
- Light trespass
- Clutter



Sky Glow: *The “bubble” of light formed above a city/town*



- Wasted light going up instead of where it is needed
- Scatters off of particles in the atmosphere and creates a “bubble” of light above
- Wasted light = wasted energy = wasted money/resources, and not to mention, a wasted starry sky!

Glare: *Light that shines directly into one's eyes*



- It's light that actually makes it harder to see!
- Makes the shadows darker = less safe
- Especially a problem for the elderly and visually impaired
- Can make for hazardous driving conditions
- Both irritating and dangerous

Light Trespass: *Light that shines past the property is generated on*

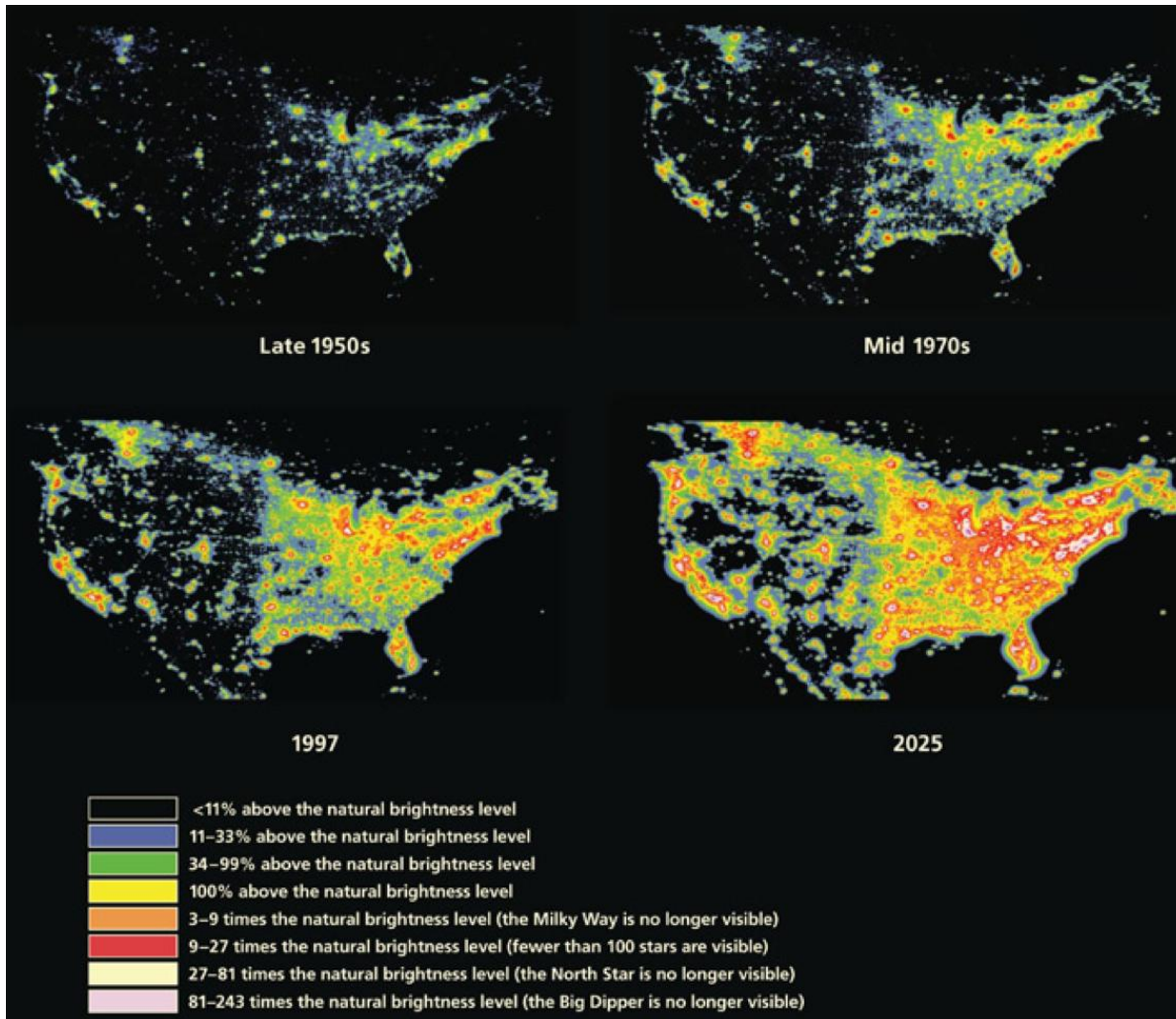


- Poorly aimed or shielded light that goes onto other peoples property
- It's about being a good neighbor
- In some ways, sky glow can also be thought of as light trespass.

Light Clutter: *Bright, confusing, and excessive grouping of lights*



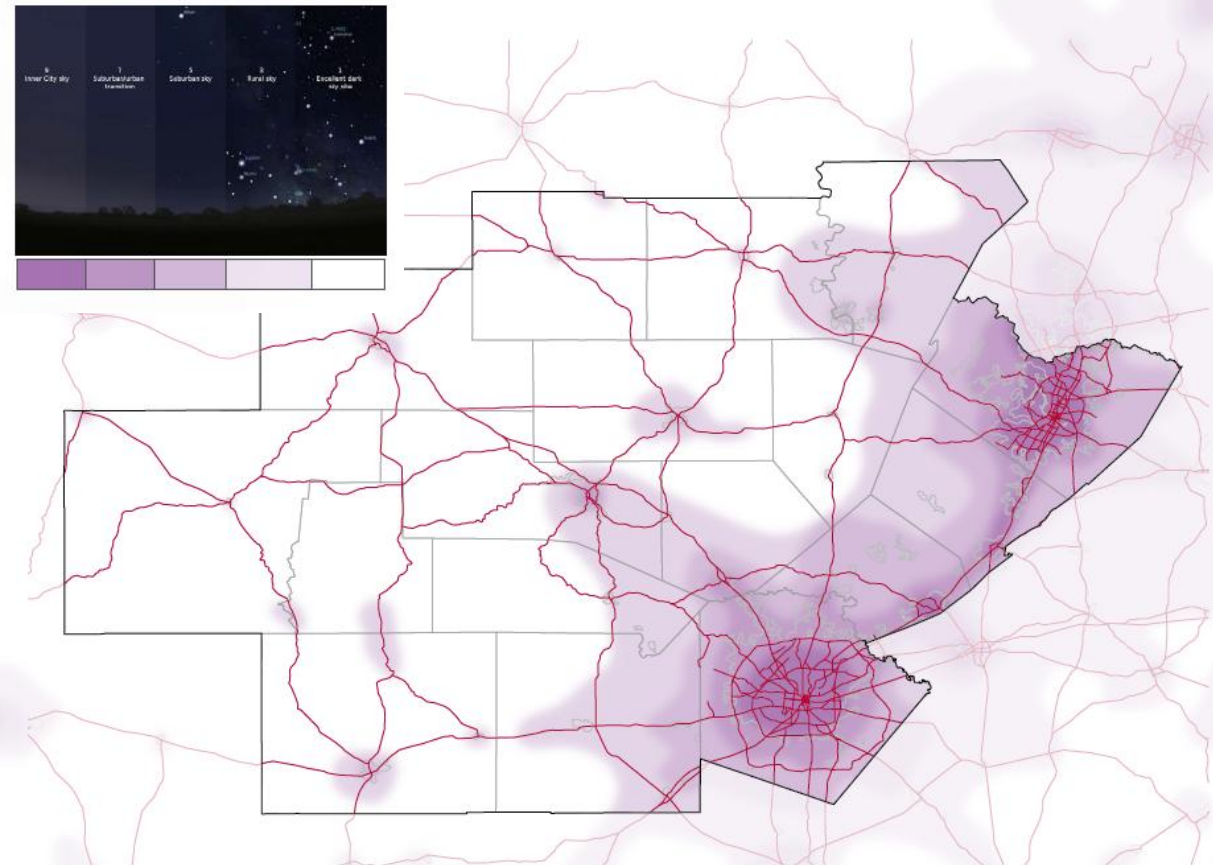
The Good News: *Light pollution is VERY reversible!*



- Water, air, and soil pollution can take generations and massive changes in our culture to reverse.
- With a handful of basic strategies we could turn the picture to the left in reverse.
- This can be done while maintaining good, safe, and functional levels of light.

The Hill Country is well on its way to making a change for the better.

LEGEND:
LIGHT POLLUTION TRANSECT



- Communities in the Hill Country are forming a barrier for light pollution

- The following towns have already adopted resolutions to curb light pollution:

- Dripping Springs
- Blanco
- Mason
- Fredericksburg
- Boerne

- Several Texas state parks have, or are working on a Dark Sky Certification

Good vs. Bad Lighting: *See the difference*



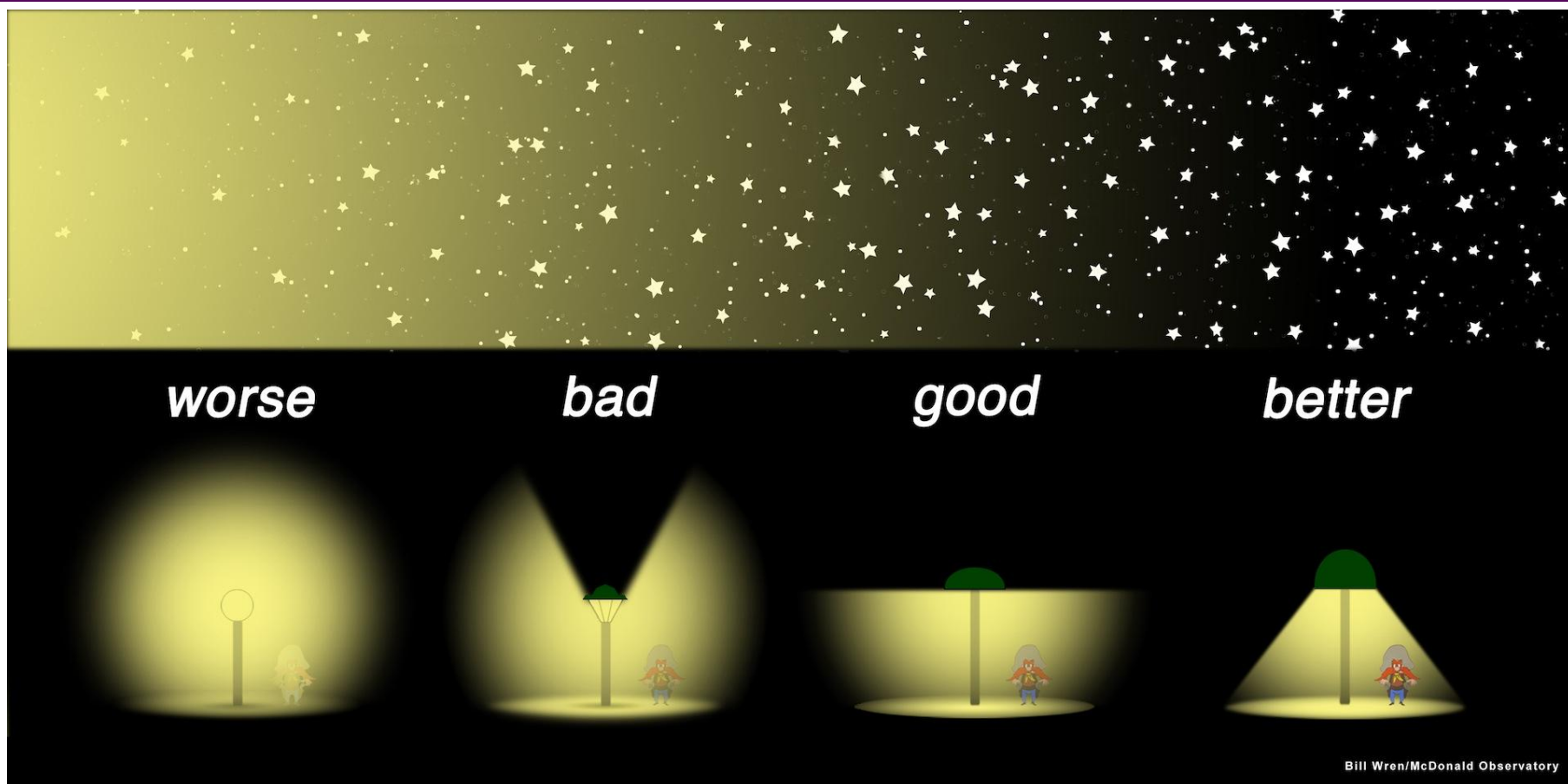
- There is a lot of glare, sky glow, and light clutter in this picture, but in the foreground is a tennis court with GOOD lighting
- See how its only going where it is needed?

Remember: *Only put the light where its needed*



- A “full cutoff” fixture does not produce any light above 90 degrees- this prevents sky glow
- A good fixture also minimizes glare and light trespass
- The color of the light should also be considered: Blue-hued light at night can have negative effects on people and animals

Remember: *Only put the light where its needed*

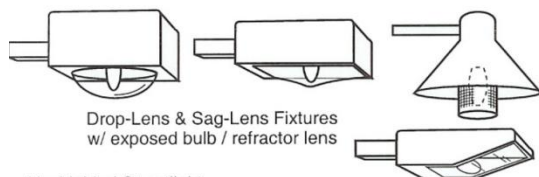
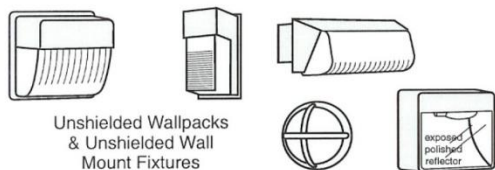
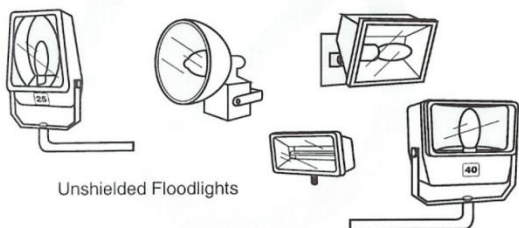


Good vs. Bad lighting: *What do you look for?*

Examples of Acceptable / Unacceptable Lighting Fixtures

Unacceptable / Discouraged

Fixtures that produce glare and light trespass

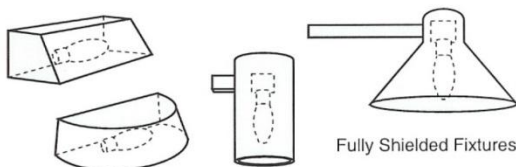
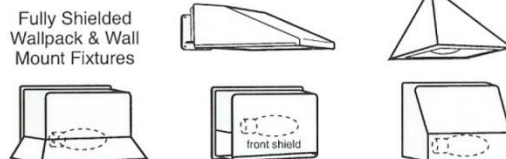
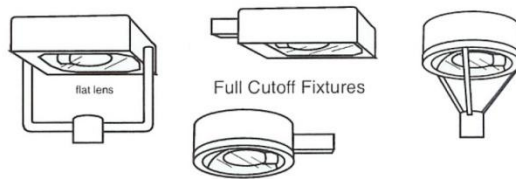


Unshielded Streetlight



Acceptable

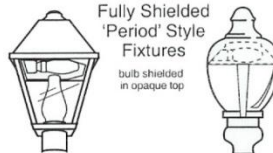
Fixtures that shield the light source to minimize glare and light trespass and to facilitate better vision at night



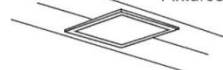
Full Cutoff Streetlight



Fully Shielded 'Period' Style Fixtures

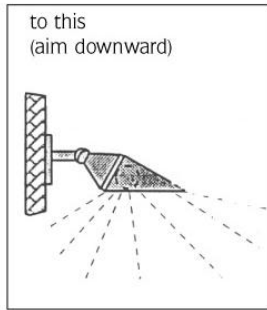
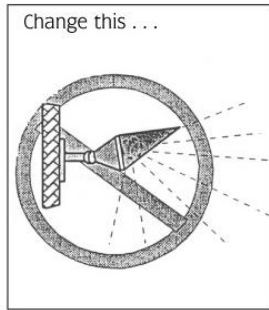


Flush Mounted Canopy Fixtures

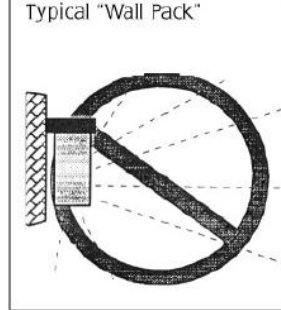


- Good light fixtures are readily available
- Look for fixtures that have the light in a shield that provides “full cutoff”
- Look around at night for examples of both.

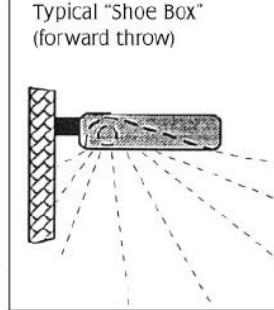
Good vs. Bad lighting: *What do you look for?*



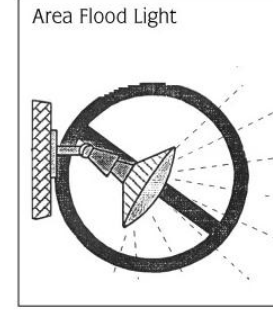
FLOOD LIGHT



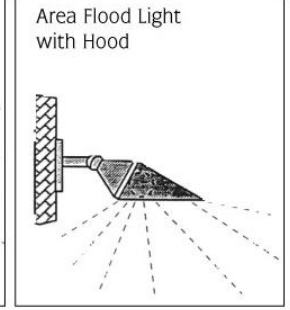
BAD



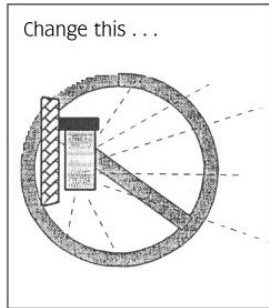
GOOD



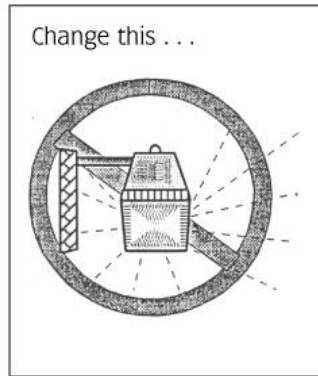
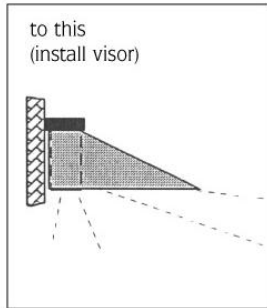
BAD



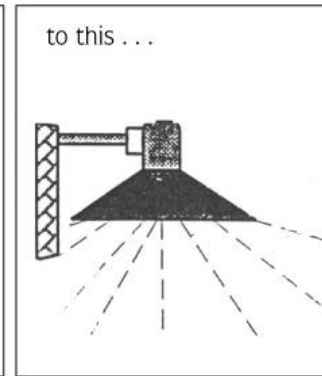
GOOD



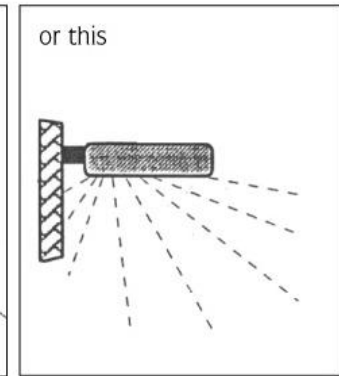
WALL PACK



YARD LIGHT



OPAQUE REFLECTOR



SHOE BOX

Good Lighting: *Where do you get it?*

Popular Categories



In-Stock Outdoor Lights



Outdoor Wall Lights



Outdoor Flush-Mount
Ceiling Lights



Outdoor Pendant Lights



Landscape Lighting



Flood Lights & Security
Lights



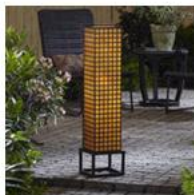
Deck Motion Lights



String Lights



Post Lights



Outdoor Lamps



Ceiling Fans



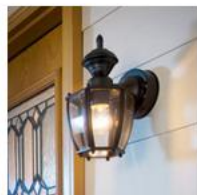
LED Outdoor Lighting



Dark Sky



Dusk to Dawn Lighting



Motion-Activated
Lighting



Energy-Efficient

- Lowes and Home Depot both have a “Dark Sky” category on their websites and in their stores
- Biedermann’s Ace Hardware in Fredericksburg stocks dark sky fixtures
- When possible, look for the IDA Dark Sky Friendly Fixture seal.



Good Lighting: *Not just about replacing fixtures*

- Timers and motion detectors can be used to limit the total time a light is on

- Shields can be added to existing fixtures



- Lights can be pointed down



- The type of bulb can be changed

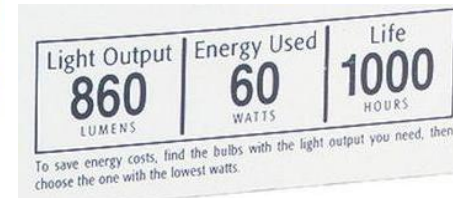


Good Lighting: *Picking a bulb*

- Lumens matter: Wattage is a measurement of power consumed by a light, not necessarily a measure of light output.
- Incandescent bulbs have an efficiency of appx. 10 lumens/watt, while LEDs can be as high as 100 lumens/watt.
- A well directed fixture needs less light. i.e. You may be able to get away with a 400 lumen bulb, where you once used 800 lumens



84 lumens/watt



14 lumens/watt

Good Lighting: *Picking a bulb- cont'd*

- The color of a bulb (color temperature) is measured in Kelvin (K),
- Remember: Warmer/redder colors are better at night. (color temp is often confusing because a cooler color temperature is actually a warmer color!)
- “Warm White” bulbs are usually 2700-3000K

Lighting Facts Per Bulb	
Brightness	800 lumens
Estimated Yearly Energy Cost \$1.14	
Based on 3 hrs/day, 11¢/kWh	
Cost depends on rates and use	
Life	22.8 years
Based on 3 hrs/day	
Light Appearance	
Warm ————— Cool	
2700 K	
Energy Used	9.5 watts

What can each of us do?

- Start with your own house
- Join the Night Sky Coop
- Talk to friends and neighbors
- Support Night Sky friendly businesses
- Work with community leaders

What we can do: *Start with your own home or business*

- Continue to research the topic:

<http://www.darksky.org>

<http://www.hillcountryalliance.org/HCA/NightSkies>

Keywords: Night Sky, Dark Sky, Light Pollution

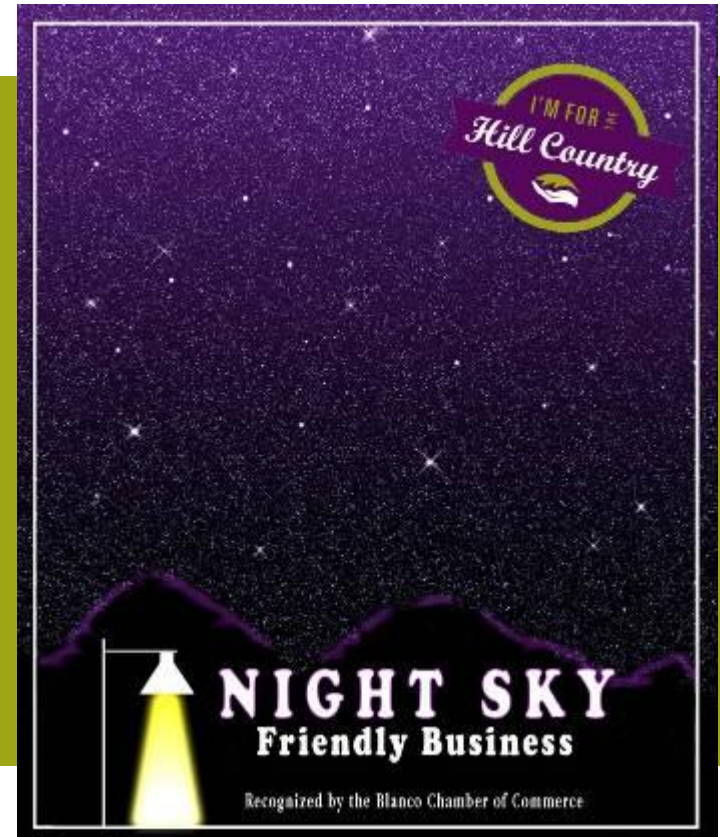
- Join the HCA Night Sky Coop- They will list your name, business and/or ranch name by county

What we can do: *Talk to friends and neighbors*

- The IDA has good advice and form letters for talking to neighbors about light pollution
- IDA and HCA both have printable material for educating others

What we can do: *Support night-sky friendly businesses*

- The HCA Night Sky Friendly Business program is a voluntary Chamber of Commerce sponsored program to help recognize night-sky friendly businesses in the community



What we can do: *Work with community leaders*

- City and county officials won't see this as an important issue unless we tell them
- The HCA and IDA websites have good resources for this
- Sometimes getting individuals and businesses involved can be a good alternative to passing ordinances

Acknowledgements and Q&A



- Thanks to Wayne Gosnell, Cindy Luongo Cassidy, Ken Kattner, and Bill Wren (McDonald Observatory) for slide material and guidance
- The International Dark Sky Association and the Texas Chapter of the IDA
- Thanks to Chris Sherman for the stunning Pedernales Falls Picture. <http://cvsherman.com>
- Questions?