# Lesson Plan For 5th Grade Students

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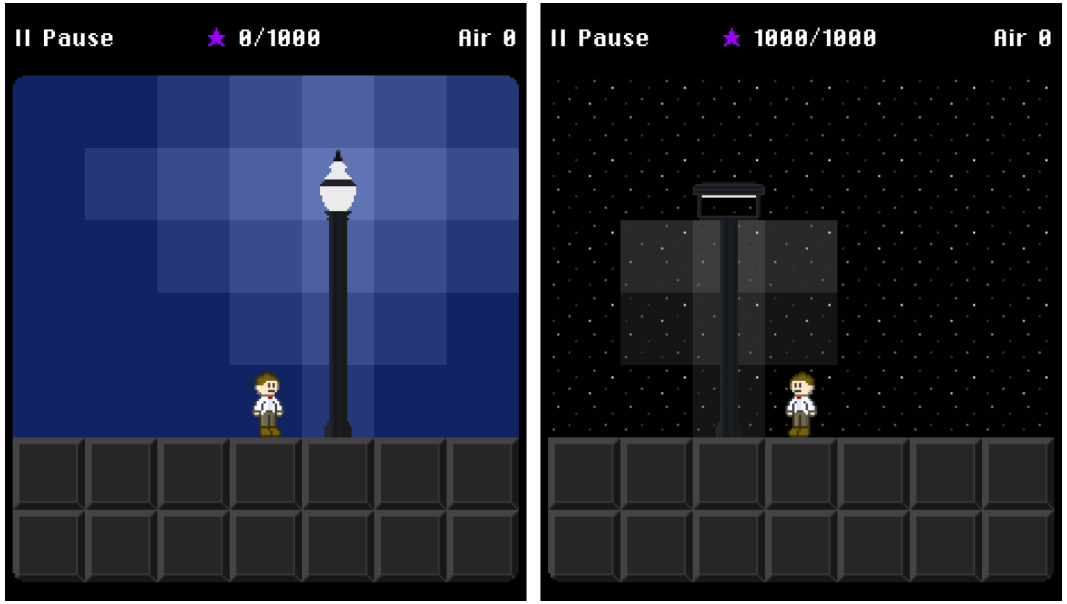
# Agenda

- Brainstorming Process
- Our Initial Idea for the Lesson Plan
- Objectives of the Lesson Plan
- The Importance of the Lesson Plan in Addressing Light Pollution
- How We Developed the Lesson Plan
- The Final Outcome
- Lessons and Insights Learned From this Experience



# Initial Ideas for Our Project

- Social Media Challenge similar to the USC Speak-Your-Mind Ice Bucket Challenge
- Create a game
- Create an interactive activity
- Lesson Plan for teachers




# Initial Idea for the Lesson Plan

- **Made for elementary school teachers and students**
- **Uses slides** for each lesson
- **Include a video** as a supplement for each lesson
- **Do an interactive class activity** at the end of the lesson
- **Physical or virtual class activity**, such as a Kahoot.
- Prizes will be given to the **top 5 students (Kahoot)**
- **Can be played in teams**

# Objectives of the Lesson Plan

**Main Learning Objective**

- Students will be able to apply what they learned from this lesson plan to reduce light pollution in their communities

**Sub-Learning objectives**

- Students will know how to reduce glare coming from lights
- Students will know how to reduce skyglow
- Students will know how to prevent light trespass into their homes
- Students will know how to reduce clutter from lights

**Together, these objectives will help students understand the importance of reducing light pollution and the ways they can reduce light pollution in their communities.**

**This helps spread public awareness about light pollution, as well as engagement for reducing light pollution in the world around them.**

# The Importance of the Lesson Plan in Addressing Light Pollution

- Educating people about the impact of issues is the best way to spread public awareness about those issues.
- Therefore, there must be a guide or an outline for spreading impactful knowledge about light pollution that will resonate in people's long-term memory.
- This is especially important when it comes to the teachers educating their students.
- The lesson plan will act as a guide to aid the teachers in effectively educating the students about the harmful impacts of light pollution on their lives and the world around them.
- The lesson plan will have easy-to-understand and interactive content that will make students critically think about ways to engage in reducing light pollution in their communities.

# How We Developed The Lesson Plan

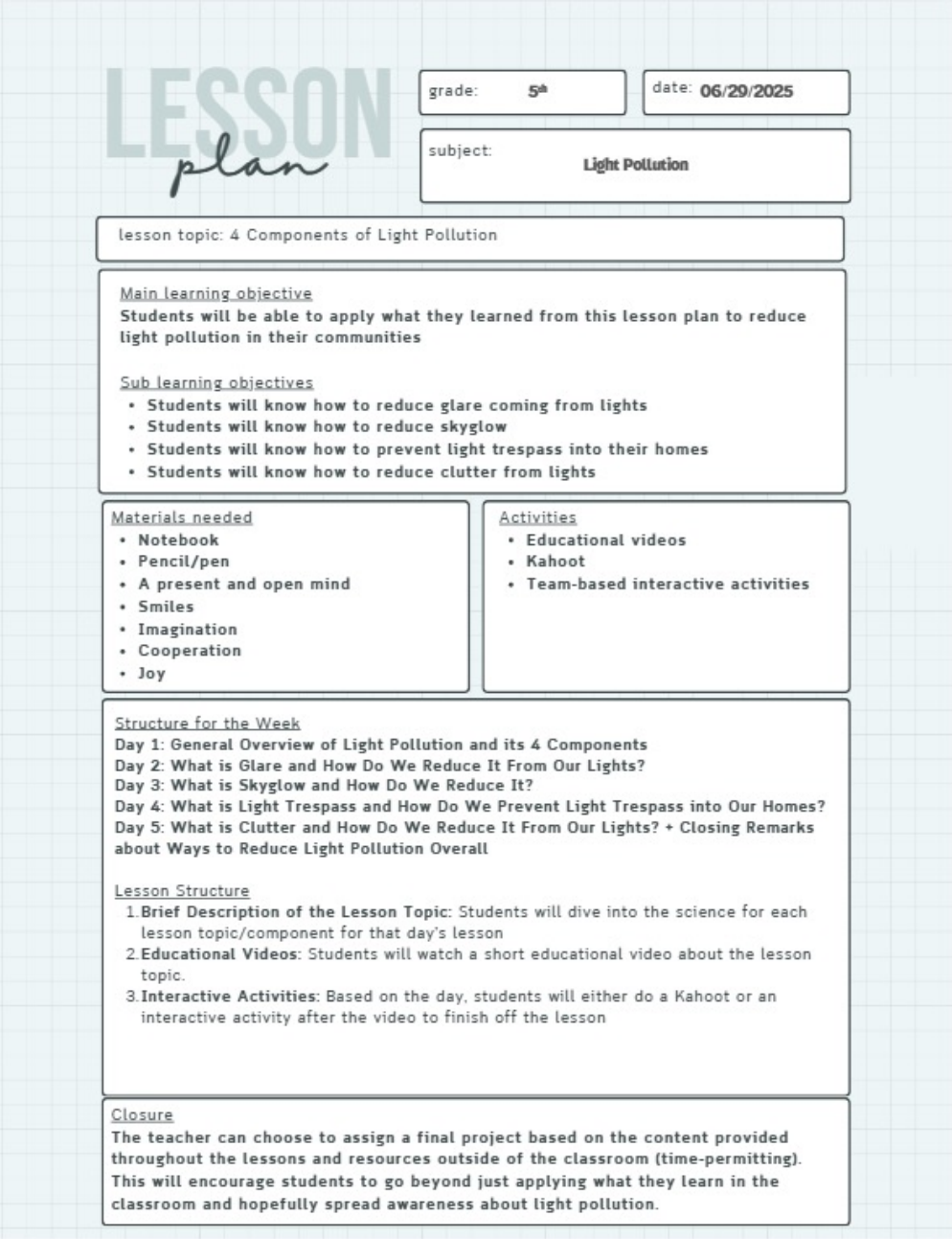
- Through literature reviews on articles explaining the development of an effective lesson plan, we wanted to improve on the initial concept of the lesson plan.
- The literature reviews suggested the lesson plan to include learning objectives that students should be able to accomplish, short educational videos related to a day's lesson topic, and one interactive activity at the end of a day's lesson.
- Through collaboration meetings with the other Teacher persona groups, they agreed to incorporate their projects in our lesson plans as interactive activities since their projects were interactive games.
- Through feedback from Professor Quick, we also included images that were related to the main topic of a lesson's slides.
- This will make the slides interesting and visually appealing.

# The Final Outcome

For the lesson plan, we included:

- Learning objectives for each day's lesson
- Brief description about the main topic for each lesson slides
- A short educational video for each lesson slides
- An interactive activity to end each lesson
- An end-of-the-month final project about light pollution that will be assessed on the content provided throughout the lessons and student's own research outside of the classroom.
- Lesson Plan will be for 5$^{th}$ grade teachers and students

# The Final Outcome



LESSON plan

grade: 5th

date: 06/29/2025

subject: Light Pollution

lesson topic: 4 Components of Light Pollution

Main learning objective

**Students will be able to apply what they learned from this lesson plan to reduce light pollution in their communities**

Sub learning objectives

- **Students will know how to reduce glare coming from lights**
- **Students will know how to reduce skyglow**
- **Students will know how to prevent light trespass into their homes**
- **Students will know how to reduce clutter from lights**

Materials needed

- **Notebook**
- **Pencil/pen**
- **A present and open mind**
- **Smiles**
- **Imagination**
- **Cooperation**
- **Joy**

Activities

- **Educational videos**
- **Kahoot**
- **Team-based interactive activities**

Structure for the Week

**Day 1: General Overview of Light Pollution and its 4 Components**
**Day 2: What is Glare and How Do We Reduce It From Our Lights?**
**Day 3: What is Skyglow and How Do We Reduce It?**
**Day 4: What is Light Trespass and How Do We Prevent Light Trespass into Our Homes?**
**Day 5: What is Clutter and How Do We Reduce It From Our Lights? + Closing Remarks about Ways to Reduce Light Pollution Overall**

Lesson Structure

1. **Brief Description of the Lesson Topic:** Students will dive into the science for each lesson topic/component for that day's lesson
2. **Educational Videos:** Students will watch a short educational video about the lesson topic.
3. **Interactive Activities:** Based on the day, students will either do a Kahoot or an interactive activity after the video to finish off the lesson

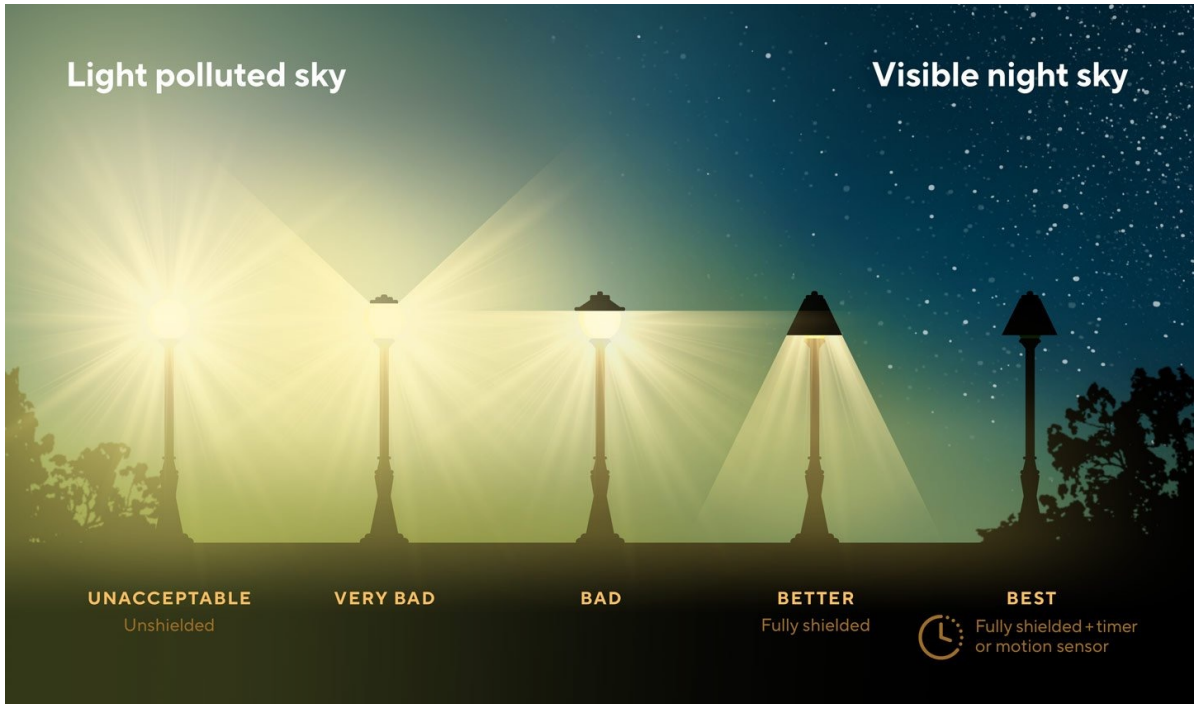
Closure

**The teacher can choose to assign a final project based on the content provided throughout the lessons and resources outside of the classroom (time-permitting). This will encourage students to go beyond just applying what they learn in the classroom and hopefully spread awareness about light pollution.**

# Day 1: General Overview of Light Pollution and its 4 Components

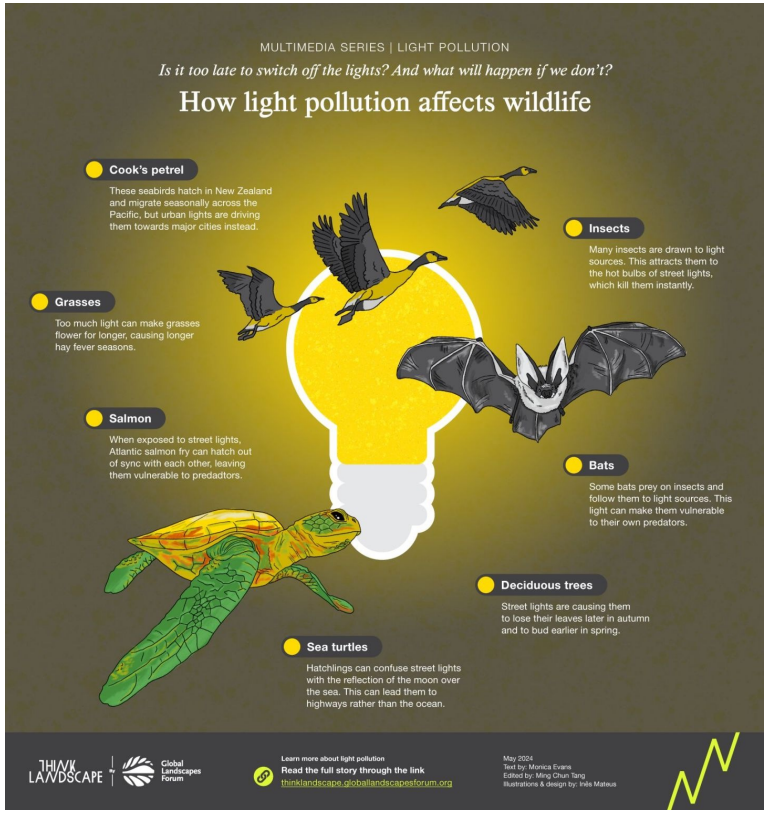
# What is Light Pollution?

- Light pollution is the excessive brightening of the sky at night.
- It is caused from poorly-designed artificial lights in our cities and towns that fail to contain unnecessary light from reflecting into the sky
- These lights include:
  - interior and exterior building lighting
  - advertising/billboards
  - streetlights
  - illuminated sporting venues



# Why is Light Pollution Bad for Us and the Environment?

- Hinders our ability to see the Milky Way and stars at night.
- Interrupts our circadian rhythm and our body's natural sleep cycle, which makes it harder for us to sleep and increases the risks of developing health conditions.
- Turns nighttime into day time for nocturnal animals, unnaturally modifying their hunting and sleeping cycles leading to their deaths.
- Disrupts the navigation of migrating animals by confusing them leading them to travel towards unsafe locations and increasing the likelihood of hitting man-made structures.

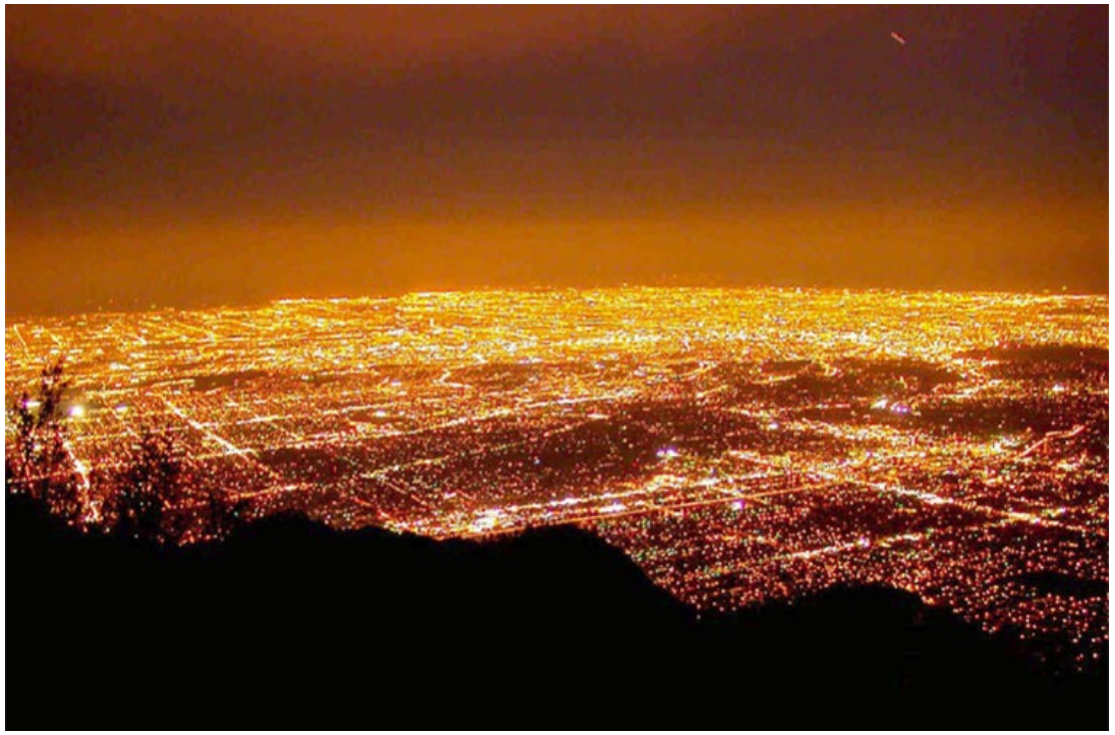


# Glare: 1st Component of Light Pollution

- Unnecessary, excessive brightness from poorly-shielded lights that causes visual distraction

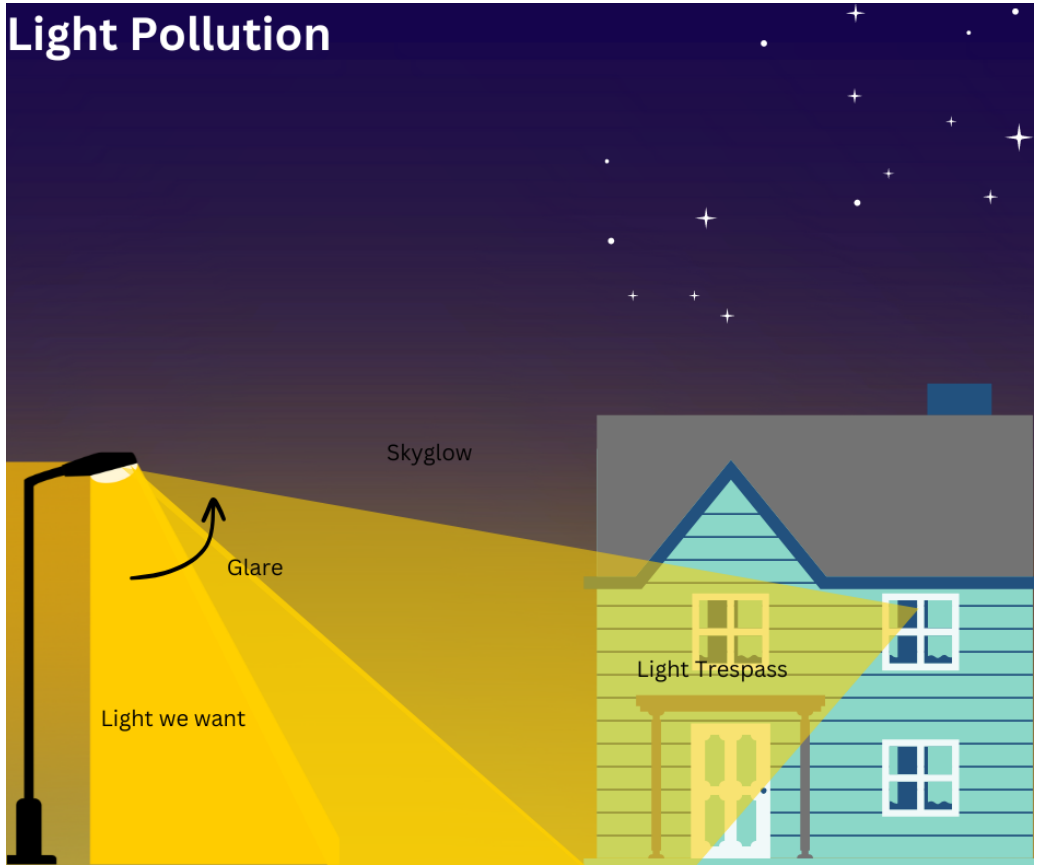
# Skyglow: 2nd Component of Light Pollution

- Excessive brightening of the sky at night in inhabited areas due to unintended light directed upwards



# Light Trespass: 3rd Component of Light Pollution

- Light spreading to unwanted spaces, like streetlight passing into your dark room at night




# Light Clutter: 4th Component of Light Pollution

- Excessive groupings of light sources that is too bright and visually confusing


# Short Video about Light Pollution

Video Link: https://www.youtube.com/watch?v=V_A78zDBwYE

# Interactive Activity: Explore the Causes

- For 10 mins, the student will individually sketch what they think a clear dark sky looks like.
- Then they will walk around the classroom and observe what their fellow classmates drew.
- They will take down notes on what they noticed and questions they might be wondering about
- Then for 5 mins, the teacher will project a local night sky using the Online Planetarium website and add notes to their charts.
- The teacher will then split the students into different groups to discuss about their similarities and differences in their notes for 15 mins.
- They will then find places that has clear dark sky using the Internet.
- Everyone in the classroom come together to discuss their findings.
- Finally, they will watch a demonstration of light pollution in a classroom.

Instruction Link: https://cdn.outdoors.org/wp-content/uploads/2022/08/05133339/See-The-Dark-Teacher-Guide.pdf (Day 1: Explore the Phenomenon)

# Reflection from this Experience

- Educating the next generations about the harmful impact of light pollution is a good starting point in spreading awareness about the issue.
- Lesson planning is an important but time-consuming process for the teachers of young children, which gave us a greater appreciation for educators of all levels.
- Lesson plans are like construction blueprints. They set the foundations and guide for building towards the objective of informing young children about the consequences of light pollution.
- It takes a lot of time to research the necessary sources of information to back up the effectiveness and credibility of a lesson plan to spread public awareness about light pollution.

# Thank You!

# Day 2: What is Glare and How Do We Reduce It From Our Lights?

# What is Glare?

- **Glare** is the excessive brightness of an artificial light source that causes visual discomfort (according to darksky.org).
- Some examples of glare include:

**Vehicle headlights**

**Sun Glare**

**Poorly designed LED streetlights**

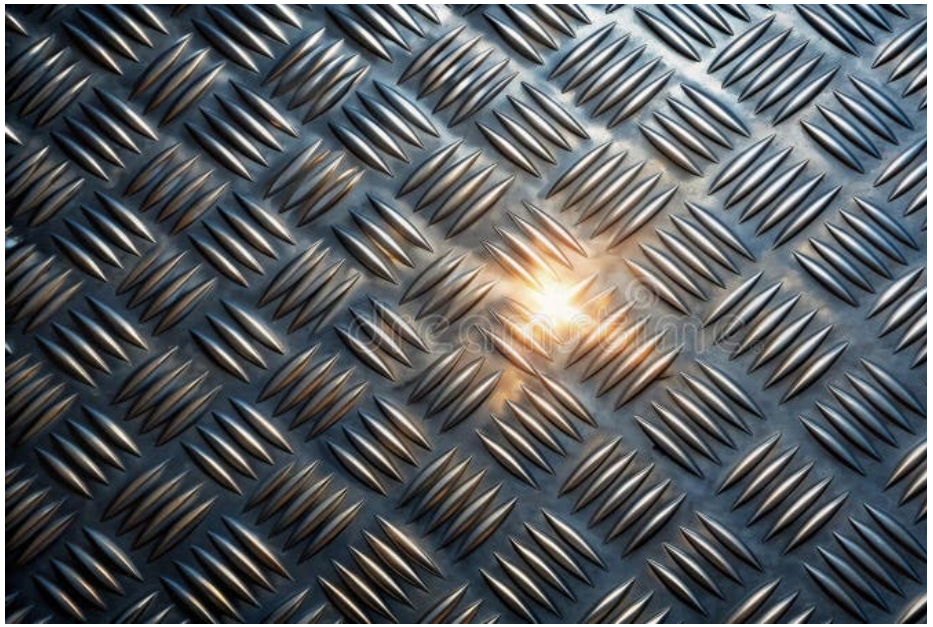
# Why is Glare Bad for Us and the Environment?

- Causes eye strain and temporary vision loss
- Causes headaches, which could lead to fatigue
- Causes a safety hazard especially when driving due to reduced details from a lack of visual contrast
- Causes animals in the environment to be distracted at nighttime
- Causes visual distraction that leads migrating birds straight into high buildings, resulting in injuries and deaths
- A component of light pollution that prevents us from seeing the Milky Way and stars at night

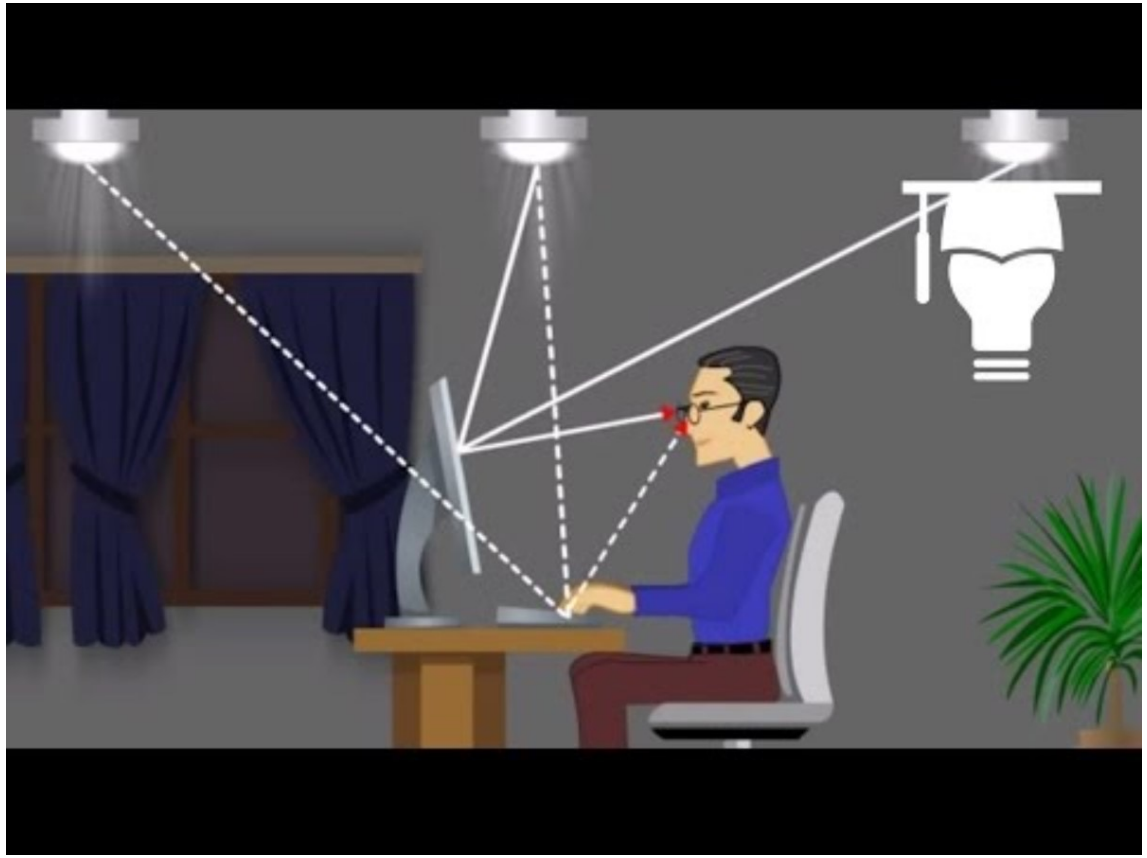
# Causes of Glare

- Excessively bright lights that are directed towards the person and not properly shielded
- Bright lights reflecting off surface such as water and metallic objects
- Temperature of the light source
- Strong blue light from electronic screens such as a phone and computer
- Cataracts in your eyes
- Aging
- Dry eye
- Fatigue





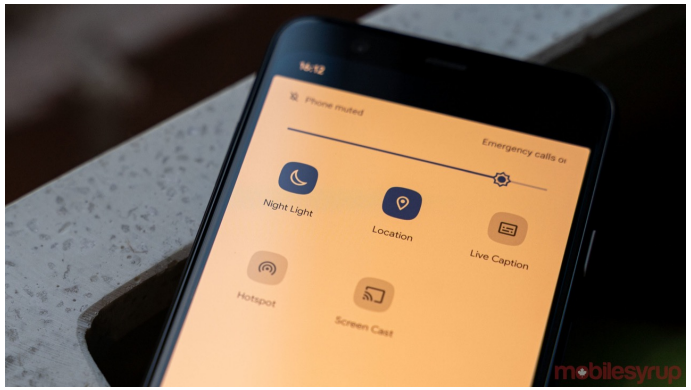
# Short Video about Glare



Video Link: https://www.youtube.com/watch?v=PwHXut8lw4M

# How to Reduce Glare?

- Directing light away from your eyes
- Use warm temperature light sources
- Use night light feature on your electronics
- Shielding bright lights and streetlights
- Wear blue light glasses that has yellowish lens when using your phone and/or computer
- Use shades, blinds or curtains to minimize glare from your windows



# Interactive Activity: Good Light, Good Night

Shielding lights improves our safety and visibility, along with improving our view of the night sky. Light pollution has health effects on animals, including people!

This activity explores light pollution and its effects on our vision, and showcases how to use light wisely by using proper shielding to direct light to where it needs to be.

Instruction Link: https://nightsky.jpl.nasa.gov/media/documents/resources/03GoodLight2020.pdf

# Sources


- National Geographic: Light Pollution

(https://education.nationalgeographic.org/resource/light-pollution)

- Definition of light pollution

(https://darksky.org/resources/what-is-light-pollution/)

- Light pollution is light out of place

(https://www.bigbenddarkskyreserve.org/what-is-light-pollution)

- Glare and Halos: Cause, Effect, and Solution

(https://www.vistareye.com/glare-and-halos-cause-effect-and-solution/)

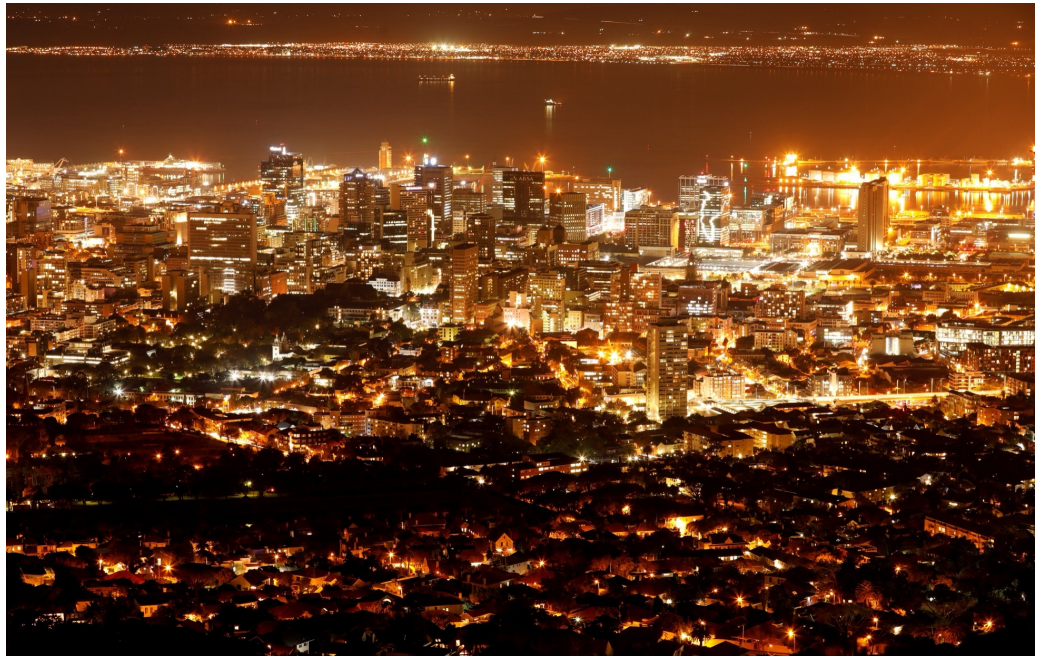
- Causes of light pollution

(https://darksky.org/resources/what-is-light-pollution/causes/)

# Day 3: What is Skyglow and How Do We Reduce It?

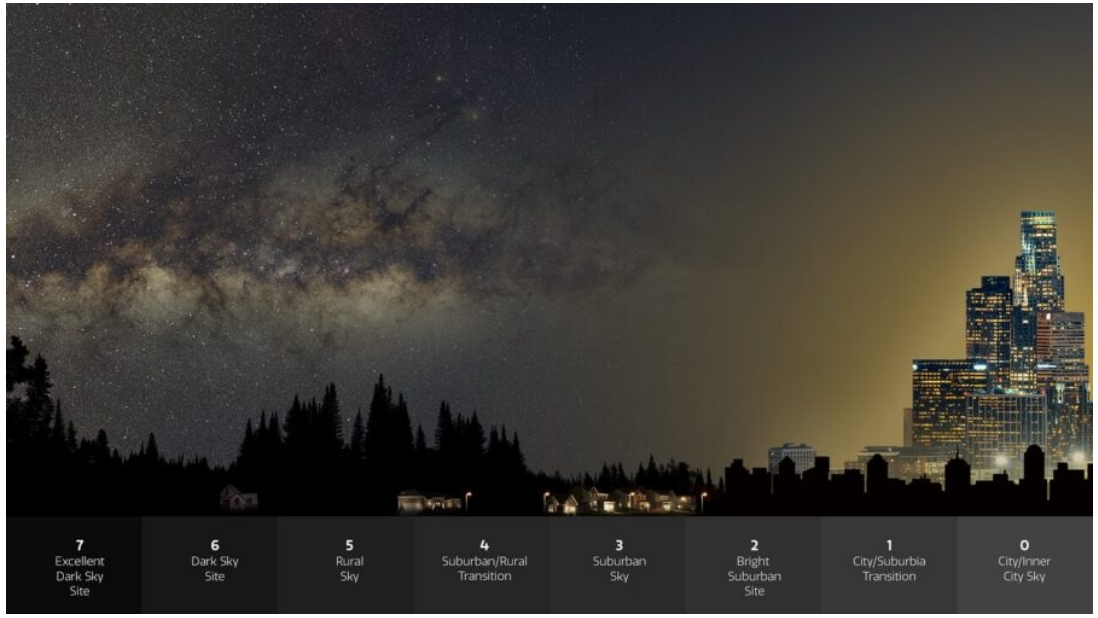
# What is Skyglow?

- **Skyglow** is the excessive and unnecessarily brightening of the sky at night.
- Some examples of skyglow:



# Causes of Skyglow

- Unshielded outdoor lighting
- Lighting being reflected towards the sky at night
- Unshielded stadium lights
- Home lighting
- Lots of unnecessary streetlights
- LED billboards and advertising lights
- Tall building lights
- Industrial lighting around factories and construction areas




# Why is Skyglow Bad for Us and the Environment?

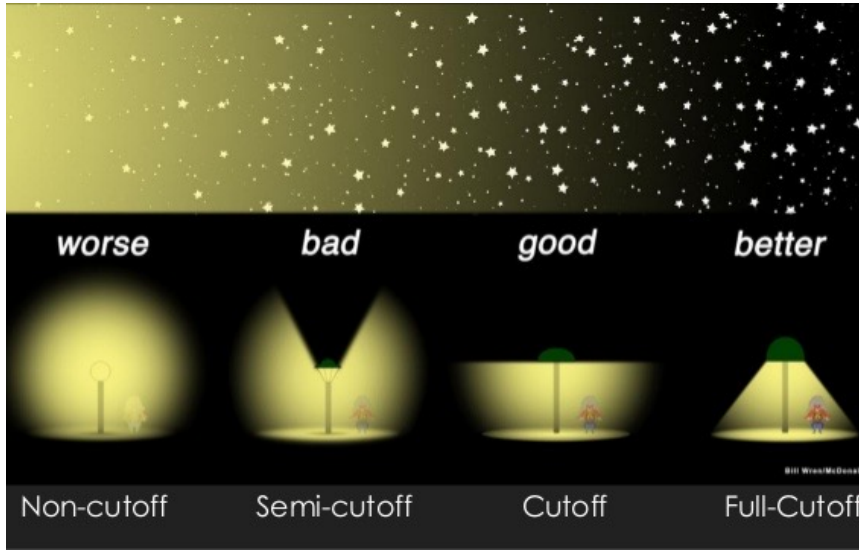
- Obstructs our view of the Milky Way and the stars at night
- Disrupts our circadian rhythm and our body's natural sleep cycle, which makes it harder for us to sleep and increases the risks of developing health conditions.
- Attracts small animals and insects into dangerous areas, like highways and "pest control" land
- Prevents nocturnal animals from resting, which can lead to their deaths
- Prevents migrating animals from using the moon as their navigation guide
- Interferes with tree's ability to detect season changes

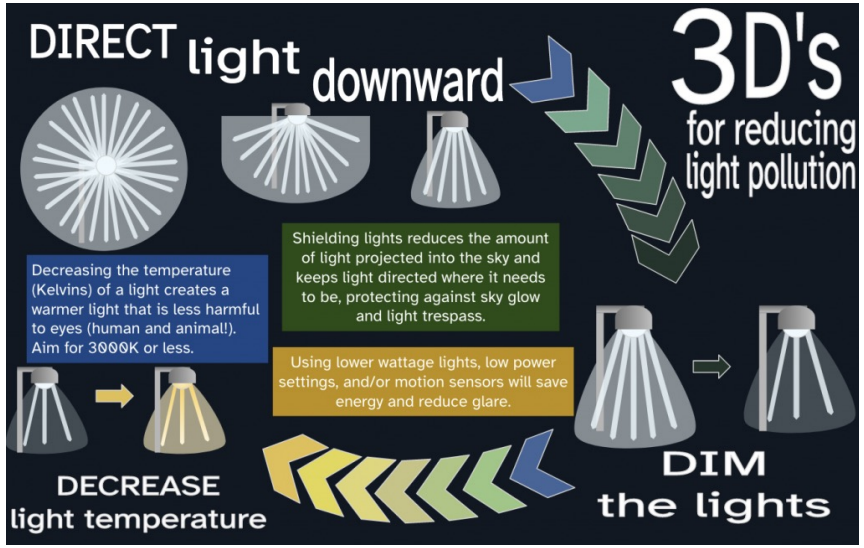
# Short Video about Skyglow


Video Link: https://vimeo.com/204478961?fl=pl&fe=sh

# How Can We Reduce Skyglow?

- Lowering the light source away from the sky
- Shielding any outdoor lighting
- Less streetlights and building light
- Lowering the temperature and intensity of the lights
- Curtains and/or blinds to prevent light from escaping



# Interactive Activity: Quality Lighting Teaching Kit

- The concepts and practices of quality lighting are explored through problem-based learning, hands-on/minds-on activities, as well as assessment probes. The six activities use quality lighting to solve realistic cases on how light pollution affects wildlife, the night sky, our eyes, energy consumption, safety and light trespass into buildings. The impact of the kits is amplified by providing professional development using a tutorial video created at NOAO and conducting question and answer sessions via Google+ Hangouts for program instructors.
- We will be using the Quality Lighting Teaching Kit for Light Pollution and Animals to understand the effect that skyglow has on migrating animals.

Instruction Video: https://noirlab.edu/public/videos/edu001a/

# Sources


- Skyglow Project

(https://skyglowproject.com/#new-page)

- What is Skyglow?

(https://darkskytexas.org/what-is-skyglow/)

- Text-Alternative Version: What Is Sky Glow?

(https://www.energy.gov/eere/ssl/text-alternative-version-what-sky-glow)

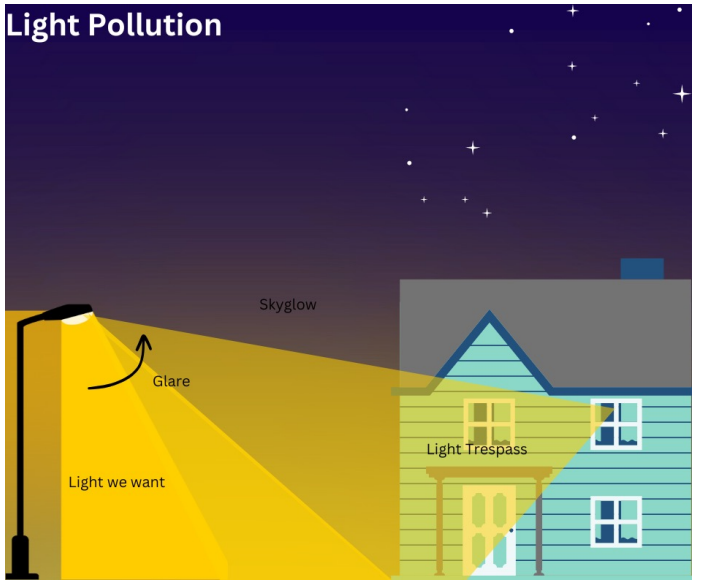
- Solutions to Light Pollution

(https://darksky.org/resources/what-is-light-pollution/light-pollution-solutions/)

# Day 4: What is Light Trespass and How Do We Prevent Light Trespass into Our Homes?

# What is Light Trespass?

- **Light trespass** happens when light goes to where it is unintended.

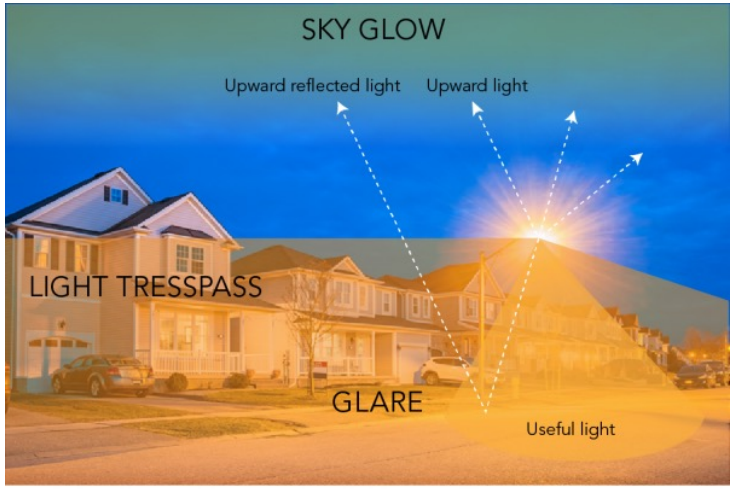



# Causes of Light Trespass

- Misdirected lighting
- Unshielded lighting
- Excessive brightness and/or temperature of lights
- Too much outdoor light sources
- Lighting that get reflected upwards from the ground

# Why is Light Trespass Bad for Us and the Environment?

- Disrupts our body's natural sleep cycle and rest
- Prevents us from getting deep sleep and regulating our blood sugar
- Obstructs our view of the Milky Way and the stars at night
- Wastes a lot of electricity and money
- Prevents nocturnal animals from resting, which can lead to their deaths
- Prevents migrating animals from using the moon as their navigation guide

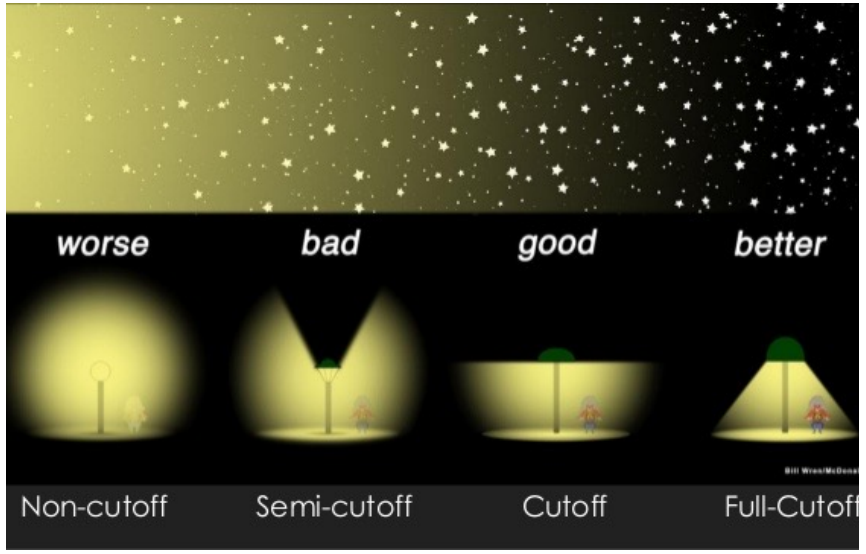



# Short Video about Light Trespass


Video Link: https://www.youtube.com/watch?v=1inqghSkJQM&t=45s

# How Can We Reduce Light Trespass?

- Turn off all indoor and outdoor lights, if possible
- Lowering the light source away your neighbor's house and/or properties
- Shielding any outdoor lighting
- Less streetlights and building light
- Lowering the temperature and intensity of the lights
- Curtains and/or blinds to prevent light from going through windows




# Interactive Activity: Quality Lighting Teaching Kit

- The concepts and practices of quality lighting are explored through problem-based learning, hands-on/minds-on activities, as well as assessment probes. The six activities use quality lighting to solve realistic cases on how light pollution affects wildlife, the night sky, our eyes, energy consumption, safety and light trespass into buildings. The impact of the kits is amplified by providing professional development using a tutorial video created at NOAO and conducting question and answer sessions via Google+ Hangouts for program instructors.
- We will be using the Quality Lighting Teaching Kit for Light Pollution and Trespass to understand the effect that skyglow has on migrating animals.

Instruction Video: https://noirlab.edu/public/videos/edu001d/

# Sources


- My neighbor’s lighting

(https://darksky.org/resources/what-is-light-pollution/light-pollution-solutions/lighting/my-neighbors-lighting/)

- Light Trespass: Preventing Lights from Glaring into Your Home

(https://ceds.org/lighttrespass/)

- What is light trespass and why should you avoid it?

(https://www.bltdirect.com/what-is-light-trespass-and-why-should-you-avoid-it)

- How to Prevent Light Trespass in Landscape Lighting

(https://www.voltlighting.com/learn/how-to-prevent-light-trespass)

# Day 5: What is Light Clutter and How Do We Reduce It?

# What is Light Clutter?

- **Light clutter** is the excessive groupings of light sources in a particular area, which results in over-lighting the area.
- It creates a lot of glare, resulting in visual disorientation for people travelling around the area.

# Why is Light Clutter Bad for Us and the Environment?

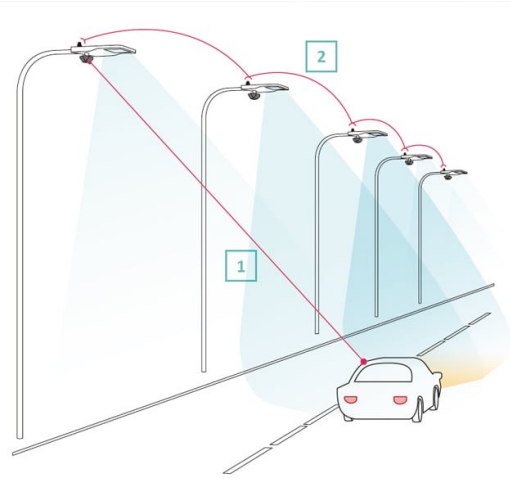

- Creates a lot of glare, which is uncomfortable to the eyes
- Creates skyglow around a highly-populated area, such as cities
- Creates a lot of light trespass
- Disrupts our body's natural sleep cycle
- Obstructs our view of the Milky Way and the stars at night
- Wastes a lot of electricity and money
- Prevents nocturnal animals from resting at the appropriate time, which can lead to their deaths
- Prevents migrating animals from using the moon as their navigation guide
- Lead migrating animals to hazards such as tall buildings

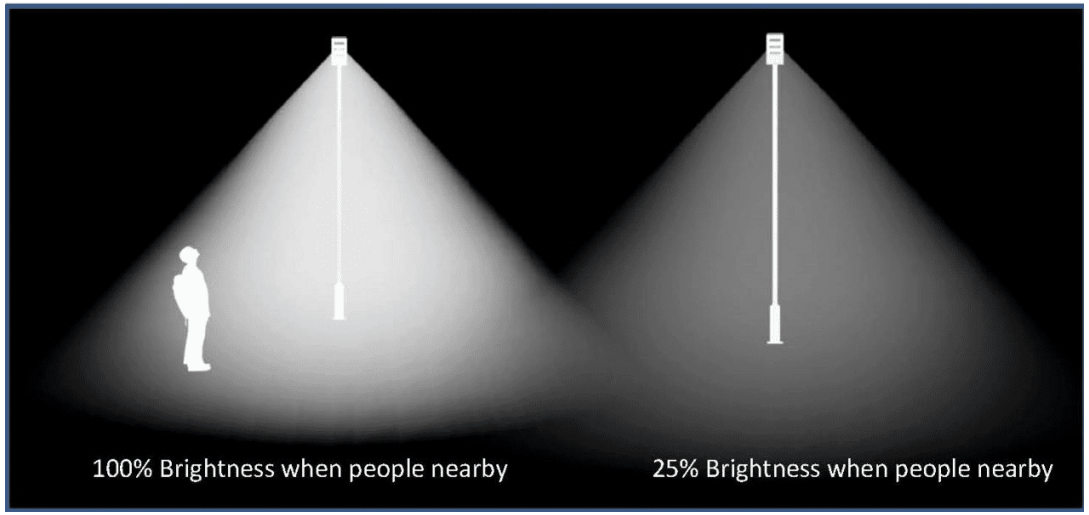
# Short Video about Light Clutter


Video Link: https://www.youtube.com/watch?v=NbmGhvZnWkI

# How Can We Reduce Light Clutter?

- Responsibly plan where to install lights, especially streetlights, efficiently so less lights is required for an area
- Using shields on outdoor lights
- Lowering the temperature and intensity of the lights
- Using motion sensors on outdoor lights so the lights are not unnecessarily on at night
- Using dimmers on outdoor lights
- Using timers on outdoor lights



# Interactive Activity: Kahoot!

1. Quick Knowledge Test of Light Pollution from this Lesson

https://create.kahoot.it/share/light-pollution/aa1056dd-3589-42d6-84fb-d9a0d67c9e73

2. Team-based Challenge Test #1 about Light Pollution

https://create.kahoot.it/share/light-pollution/ddaf5599-8ef1-4d02-b571-0a70ad35410c

3. Team-based Challenge Test #2 about Light Pollution

https://create.kahoot.it/share/light-pollution/fdeae31a-fd69-469f-8298-b405276bd9a4

**Website for help if needed:** https://www.lightpollutionmap.info/

# Closing Remarks about Light Pollution

- As you have learned, the solutions to reducing light pollution are simple and easy to do.
- However, we can’t reduce the growing dangers of light pollution if we don’t collectively act on the problem.
- It is important to actively engage in minimizing the impacts of the 4 main components of light pollution by implementing the methods to reduce each component.
- If everyone in our communities come together and start the efforts to reducing light pollution, we will eventually experience a clear dark sky at night once again, with the Milky Way and all its stars.
- I hope you can take what you learned about light pollution this week to start raising awareness the ways to reduce the harmful effects of light pollution with your family and friends.

# Sources


- Light Pollution

(https://www.blancocountynightsky.org/lightpollution.php)

- Types of Light Pollution

(https://escidarksky.wordpress.com/types-of-light-pollution/)

- Light Pollution: Clutter

(https://www.fiverivers.com/info-light-pollution-clutter.html)

- How to Reduce Light Pollution in Commercial & Industrial Spaces

(https://www.industrialcommerciallighting.com/blog/how-to-reduce-light-pollution-in-commercial--industrial-spaces.html)

- Light Pollution: The Overuse & Misuse of Artificial Light at Night

(https://www.jmu.edu/planetarium/light-pollution.shtml)