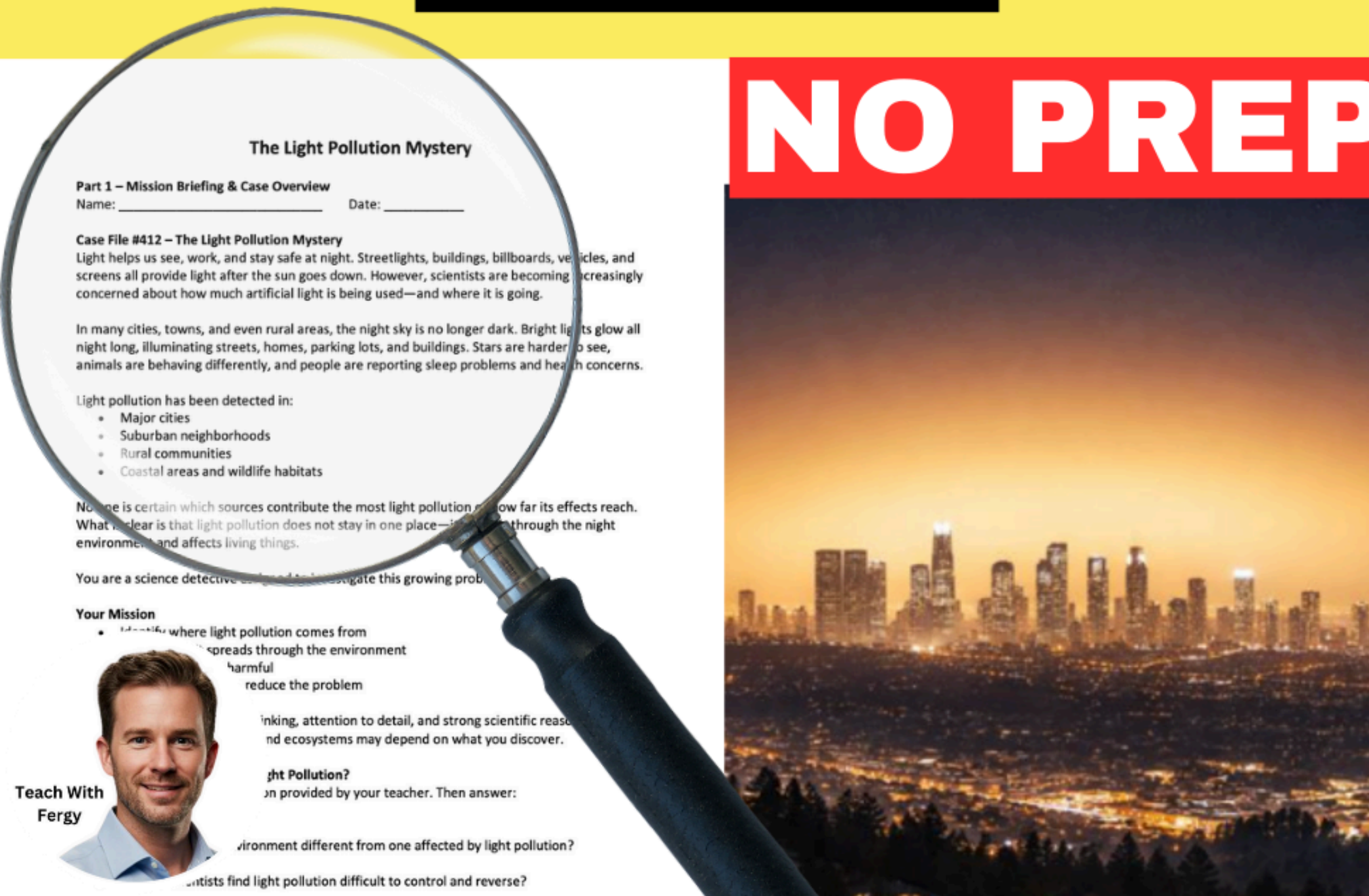


# THE LIGHT POLLUTION MYSTERY

Gamify your students' learning with this interactive and engaging Mystery Activity.

**NO PREP**



**The Light Pollution Mystery**

**Part 1 – Mission Briefing & Case Overview**  
Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Case File #412 – The Light Pollution Mystery**  
Light helps us see, work, and stay safe at night. Streetlights, buildings, billboards, vehicles, and screens all provide light after the sun goes down. However, scientists are becoming increasingly concerned about how much artificial light is being used—and where it is going.

In many cities, towns, and even rural areas, the night sky is no longer dark. Bright lights glow all night long, illuminating streets, homes, parking lots, and buildings. Stars are harder to see, animals are behaving differently, and people are reporting sleep problems and health concerns.

Light pollution has been detected in:

- Major cities
- Suburban neighborhoods
- Rural communities
- Coastal areas and wildlife habitats

No one is certain which sources contribute the most light pollution or how far its effects reach. What is clear is that light pollution does not stay in one place—it spreads through the night environment and affects living things.

You are a science detective assigned to investigate this growing problem.

**Your Mission**

- Determine where light pollution comes from
- Determine how light pollution spreads through the environment
- Determine how light pollution is harmful
- Determine how to reduce the problem

Thinking, attention to detail, and strong scientific reasoning skills are needed. Your mission and ecosystems may depend on what you discover.

**Light Pollution?**  
Information provided by your teacher. Then answer:

Is the environment different from one affected by light pollution?

Scientists find light pollution difficult to control and reverse?

**Teach With Fergy**

**SCROLL**  
to take a look inside!

**DETECTIVE FILE ON HOW HUMANS  
IMPACT THE ENVIRONMENT**



A complete student case file with guided worksheets for every step of the investigation.



10 detailed evidence cards based on real forever chemicals research and real-world examples that include images, graphs, and text.



A full teacher answer key with sample responses and support for grading.

# What You Get

**NO-PREP. JUST PRINT TO GO!**

Full investigation breakdown

Interpretation of Data

10 Evidence Cards to Determine Culprit

| Lighting Category                       | Indicator                                | Value        | Source                                                                               |
|-----------------------------------------|------------------------------------------|--------------|--------------------------------------------------------------------------------------|
| Global Electricity for All Lighting     | % of global electricity consumption      | ~15-20%      | Lighting estimates often place global use of electricity for lighting in this range. |
| Urban Public/Street Lighting            | % of municipal electricity use           | up to 40%    | Street and public area lighting can be a large share of city electricity.            |
| Residential Lighting (U.S.)             | % of residential electricity use         | ~6%          | U.S. homes: lighting about 6% of electricity.                                        |
| Commercial Lighting (U.S.)              | % of commercial building electricity use | ~17%         | Lighting in commercial buildings higher than residential.                            |
| Streets Worldwide                       | Number of streetlight poles              | ~320 million | Global streetlight infrastructure.                                                   |
| CO <sub>2</sub> Emissions from Lighting | % of global CO <sub>2</sub> emissions    | ~5%          | Lighting contributes to greenhouse gas emissions.                                    |

**Detective Prompt:**  
How does increased nighttime lighting affect energy use and the environment?

**Evidence Card 9 - Satellite Image of Earth at Night**  
Satellite images reveal bright regions across continents at night, demonstrating how artificial light escapes upward and spreads far beyond its original source.

**Detective Prompt:**  
What does widespread nighttime brightness suggest about the scale of light pollution?

# HOW THIS ACTIVITY HELPS YOU

- Saves prep time with a fully structured, print-and-go investigations.
- Drives high engagement while still meeting academic goals as students are interested in what they're doing.
- Builds deep understanding with **real-world relevance** as they analyze real evidence, make connections, and using CER to explain human impact.

## 10-PART INVESTIGATION

Students:

1. Step into the role of a Science Detective.
2. Examine real scientific evidence from around the world.
3. Track the hidden pathways of **Light Pollution**.
4. Interrogate suspects (streetlights, commercial lighting, vehicles, etc.) and identify the main culprits.
5. Build a scientific case using Claim-Evidence-Reasoning.
6. Propose real solutions that matter.

“

★★★★★ The added images and graphs enhanced the activity. My students were engaged and motivated during the case study, and it was an effective introduction to the topics. - Mystery Resource Buyer”

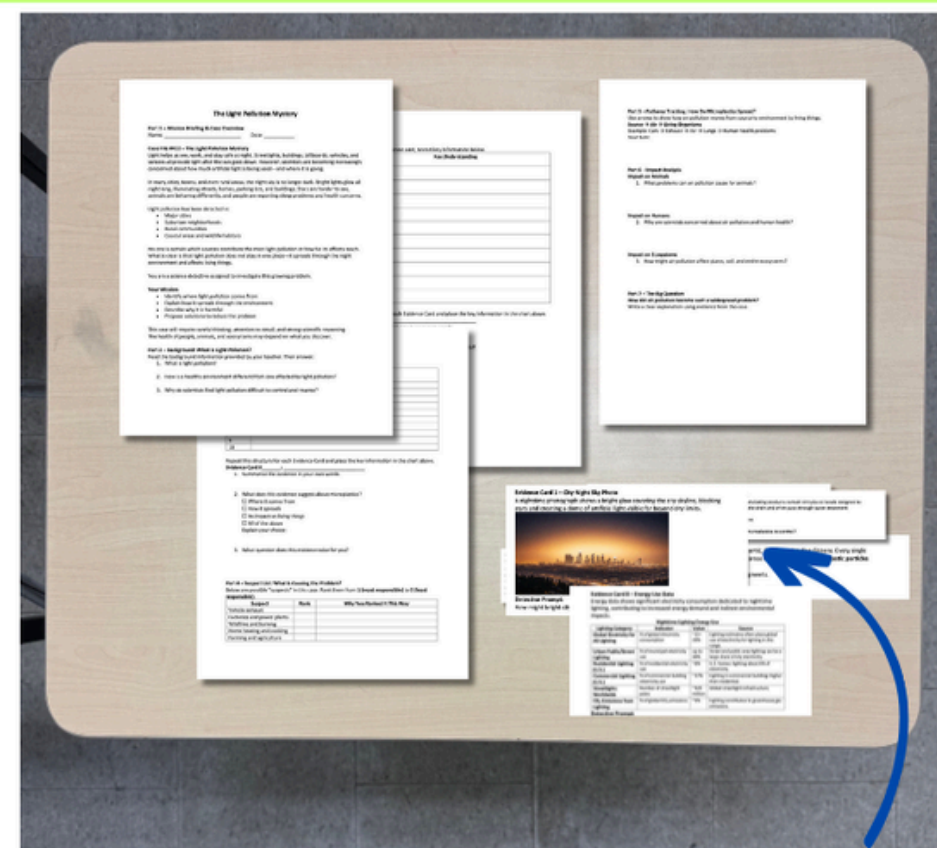
# HOW THIS MYSTERY WILL HELP YOU



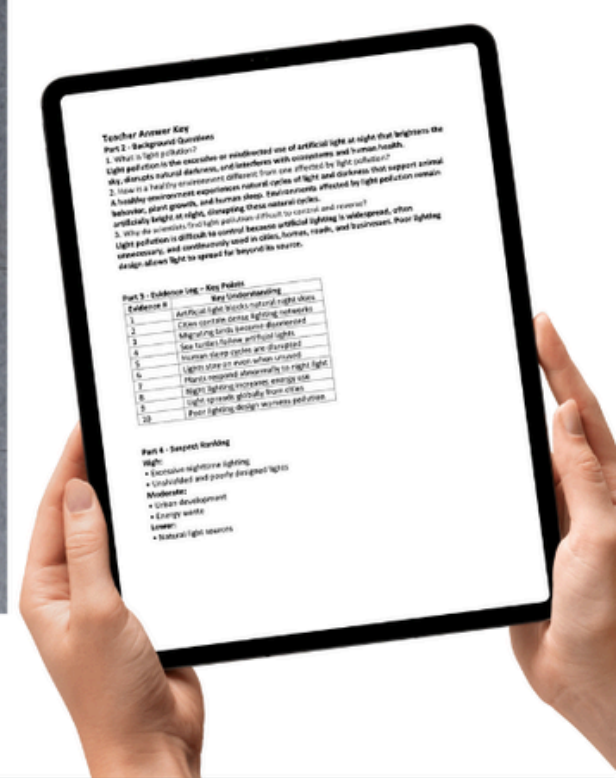
- Prep-FREE and fully editable Mystery Investigation - just print/upload and assign with no materials.
- **Evidence Cards** can be printed with and without images or projected on board.
- Engages every learner through hands-on, high-interest mystery investigations that boost motivation and participation.
- **Builds essential skills** such as graph interpretation, problem-solving, teamwork, creativity, and communication.

# What Will Your Students Learn?

**FULLY EDITABLE AND READY-TO-GO INVESTIGATION**



**FULL  
ANSWER KEY**



**EVIDENCE CARDS**

“★★★★★ This product will make a great addition of Environmental Mystery Mondays for my Environmental Issues Curriculum, with no teacher prep needed. - Mystery Resource Buyer”

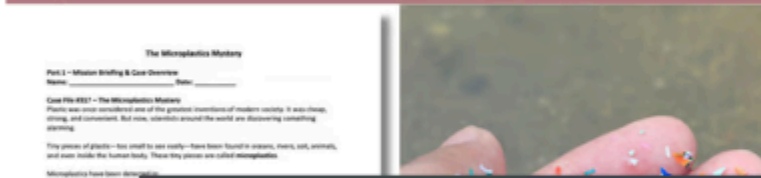
- ✓ What light pollution is and how artificial lighting alters natural darkness.
- ✓ How nighttime lighting disrupts wildlife behavior, plant cycles, and ecosystems.
- ✓ Why light pollution affects human sleep, health, and energy use.
- ✓ How cities, homes, roads, and businesses contribute to sky glow.
- ✓ How to analyze data and evidence to identify patterns and draw conclusions.
- ✓ How to use Claim–Evidence–Reasoning (CER) to support scientific arguments.
- ✓ How to trace cause-and-effect relationships in complex environmental systems.

# Upgrade to the Environmental Science Detective Mystery Bundle

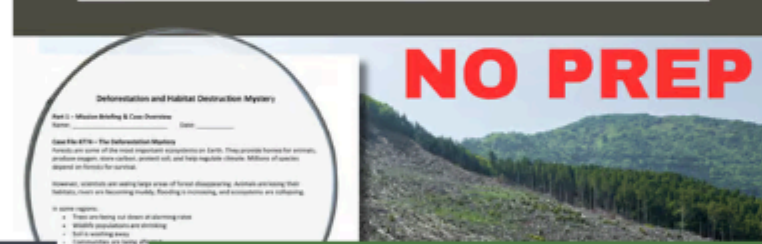
Get all my Environmental Science Mystery Activities plus all additional ones I create in the future.

## ENVIRONMENTAL SCIENCE DETECTIVE MYSTERY BUNDLE

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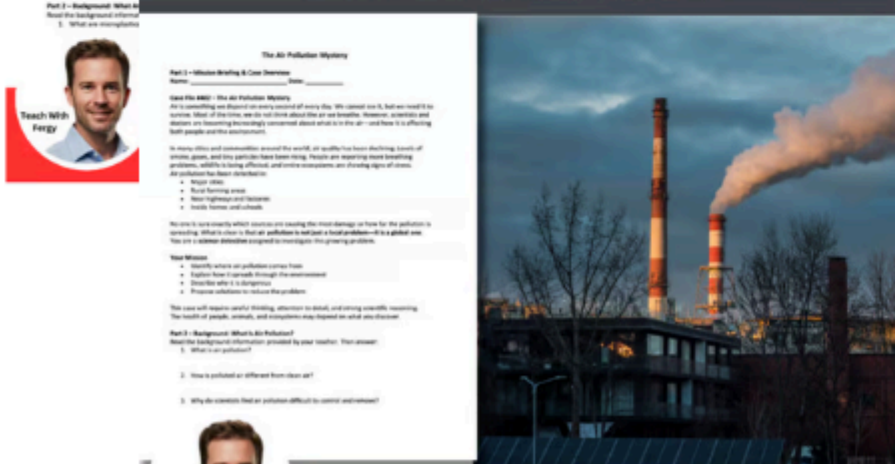
### DEFORESTATION & HABITAT DESTRUCTION MYSTERY



### THE RESOURCE DEPLETION & MINING MYSTERY



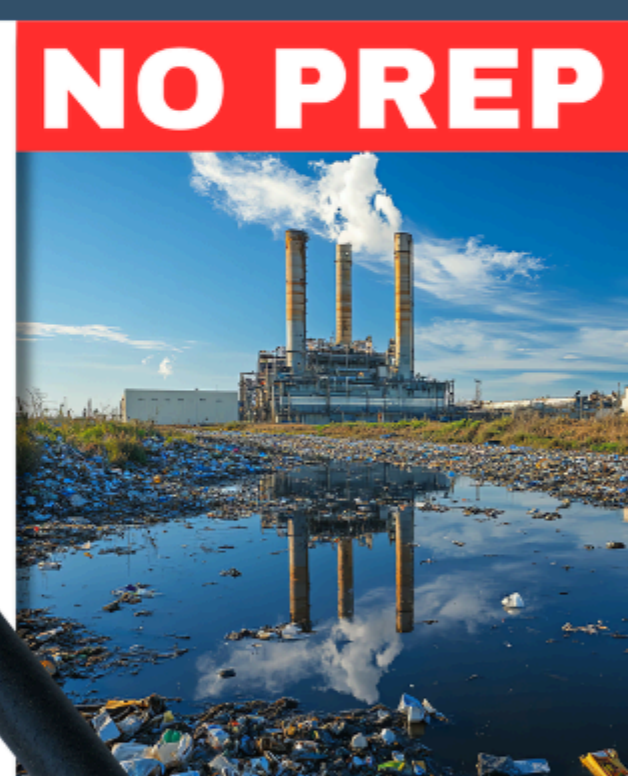
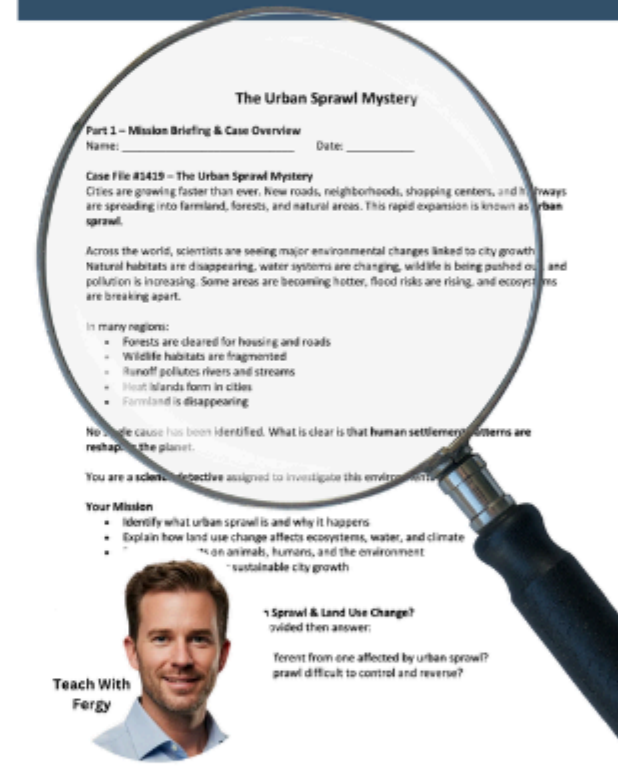
### THE AIR POLLUTION MYSTERY DETECTIVE FILE ON AIR POLLUTION & THE ENVIRONMENT



### THE INVASIVE SPECIES MYSTERY



### DETECTIVE FILE ON HOW HUMANS IMPACT THE ENVIRONMENT



### DETECTIVE FILE ON HOW HUMANS IMPACT THE ENVIRONMENT

Plus Many More!  
Click Here

# Part 1 & 2

## The Light Pollution Mystery

### Part 1 – Mission Briefing & Case Overview

Name: \_\_\_\_\_ Date: \_\_\_\_\_

#### Case File #412 – The Light Pollution Mystery

Light helps us see, work, and stay safe at night. Streetlights, buildings, billboards, vehicles, and screens all provide light after the sun goes down. However, scientists are becoming increasingly concerned about how much artificial light is being used—and where it is going.

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Light pollution has been detected in:

- Major cities
- Suburban neighborhoods
- Rural communities
- Coastal areas and wildlife habitats

No one is certain which sources contribute the most light pollution or how far its effects reach. What is clear is that light pollution does not stay in one place—it spreads through the night environment and affects living things.

You are a science detective assigned to investigate this growing problem.

#### Your Mission

- Identify where light pollution comes from
- Explain how it spreads through the environment
- Describe why it is harmful
- Propose solutions to reduce the problem

This case will require careful thinking, attention to detail, and strong scientific reasoning. The health of people, animals, and ecosystems may depend on what you discover.

### Part 2 – Background: What Is Light Pollution?

Read the background information provided by your teacher. Then answer:

1. What is light pollution?
2. How is a healthy environment different from one affected by light pollution?
3. Why do scientists find light pollution difficult to control and reverse?

## Part 1 – Mission Briefing & Case Overview

Students are introduced to the light pollution problem and take on the role of science detectives. They learn their mission and begin the investigation with a real-world hook.

## Part 2 – Background: What is Light Pollution?

Students read a short background passage and answer guiding questions to build foundational understanding before analyzing evidence.

# Part 3 & 4

## Part 3 – Evidence Log

Students begin examining the evidence cards and record key information, observations, and insights in their evidence log.

**Part 3 – Evidence Log:** As you examine each evidence card, record key information below.

| Evidence # | Key Understanding |
|------------|-------------------|
| 1          |                   |
| 2          |                   |
| 3          |                   |
| 4          |                   |
| 5          |                   |
| 6          |                   |
| 7          |                   |
| 8          |                   |
| 9          |                   |
| 10         |                   |

Repeat this structure for each Evidence Card and place the key information in the chart above.

**Evidence Card # \_\_\_\_\_:**

- Summarize the evidence in your own words.
- What does this evidence suggest about light pollution?  
☐ What causes it  
☐ Pathway  
☐ Its impact on living things  
Explain your choice:
- What question does this evidence raise for you?

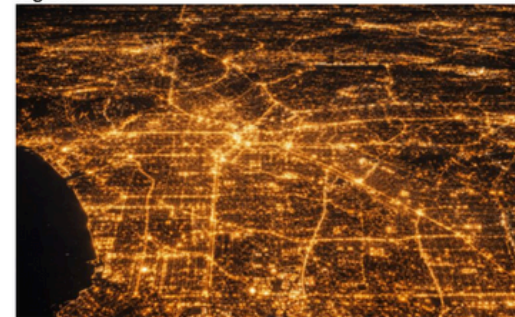
**Part 4 – Suspect List: What Is Causing the Problem?**

Rank the suspects from 1 (most responsible) to 5 (least responsible).

| Suspect                          | Rank | Why You Ranked It This Way |
|----------------------------------|------|----------------------------|
| Streetlights                     |      |                            |
| Commercial lighting & billboards |      |                            |
| Homes & outdoor lighting         |      |                            |
| Vehicles & headlights            |      |                            |
| Sports fields & event lighting   |      |                            |

**Evidence Card 2 – Streetlight Density Map**

A detailed map displays thousands of streetlights clustered across urban and suburban areas, showing how artificial lighting is spread continuously across large regions.



**Detective Prompt:**

How could large numbers of streetlights change nighttime conditions across wide areas?

**Evidence Card 8 – Energy Use Data**

Energy data shows significant electricity consumption dedicated to nighttime lighting, contributing to increased energy demand and indirect environmental impacts.

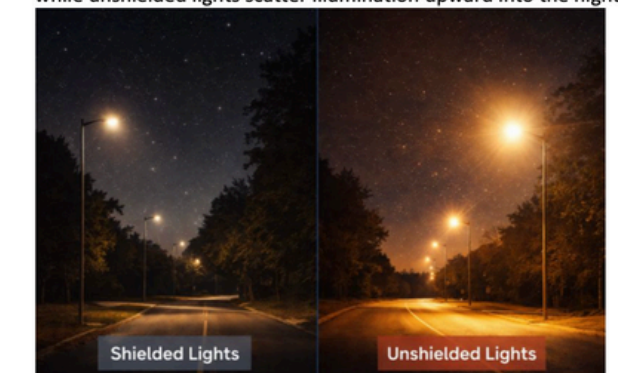
| Nighttime Lighting Energy Use           |                                          |              |                                                                                      |
|-----------------------------------------|------------------------------------------|--------------|--------------------------------------------------------------------------------------|
| Lighting Category                       | Indicator                                | Value        | Source                                                                               |
| Global Electricity for All Lighting     | % of global electricity consumption      | ~15–20%      | Lighting estimates often place global use of electricity for lighting in this range. |
| Urban Public/Street Lighting            | % of municipal electricity use           | up to 40%    | Street and public area lighting can be a large share of city electricity.            |
| Residential Lighting (U.S.)             | % of residential electricity use         | ~6%          | U.S. homes: lighting about 6% of electricity.                                        |
| Commercial Lighting (U.S.)              | % of commercial building electricity use | ~17%         | Lighting in commercial buildings higher than residential.                            |
| Streetlights Worldwide                  | Number of streetlights                   | ~230 million | Global streetlights infrastructure.                                                  |
| CO <sub>2</sub> Emissions from Lighting | %                                        |              |                                                                                      |

**Detective Prompt:**

How does increased nighttime lighting energy use contribute to environmental impacts?

**Evidence Card 10 – Shielded vs Unshielded Lights**

A comparison shows downward-facing shielded lights reduce glare and sky glow, while unshielded lights scatter illumination upward into the night sky.



**Detective Prompt:**

How might lighting design influence how much light pollution is created?

## Part 4 – Evidence Analysis

Students summarize each piece of evidence, identify what it reveals about light pollution, and generate questions, building critical thinking and reasoning skills.

# EVIDENCE CARDS

➤ All Evidence Cards come in two versions - *With images and graphs and Without* and can be printed or projected as needed.

➤ Students analyze each Evidence Card and record the following in their **Evidence Log**

1. Summarize the evidence in their own words.
2. Determine what this evidence suggests
  - ☐ What causes it
  - ☐ Pathway
  - ☐ Its impact on living things
3. Explain what question(s) this evidence raises for them?

**Images  
&  
Graphs**

## Evidence Card 8 – Energy Use Data

Energy data shows significant electricity consumption dedicated to nighttime lighting, contributing to increased energy demand and indirect environmental impacts.

| Nighttime Lighting Energy Use           |                                          |              |
|-----------------------------------------|------------------------------------------|--------------|
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### Detective Prompt:

How does increased nighttime lighting affect energy use and the environment?

**Evidence Card 9 – Satellite Image of Earth at Night**  
Satellite images reveal bright regions across continents at night, demonstrating how artificial light escapes upward and spreads far beyond its original source.



### Detective Prompt:

What does widespread nighttime brightness suggest about the scale of light pollution?

## Evidence Card 7 – Plant Growth Study

Plants exposed to artificial light at night demonstrated the following when compared to plants experiencing natural darkness.

| Plant Responses to Artificial Light at Night |                                 |                               |
|----------------------------------------------|---------------------------------|-------------------------------|
| Plant Response                               | Natural Darkness                | Artificial Light at Night     |
| Growth Patterns                              | Normal, balanced growth         | Altered or irregular growth   |
| Flowering Timing                             | Flowers at normal seasonal time | Flowering is delayed          |
| Seasonal Cycles                              | Follows natural seasonal cycles | Seasonal cycles are disrupted |

### Detective Prompt:

How could nighttime light disrupt natural growth cycles in plants?

## Evidence Card 8 – Energy Use Data

Energy data shows significant electricity consumption dedicated to nighttime lighting, contributing to increased energy demand and indirect environmental impacts.

| Nighttime Lighting Energy Use           |                                          |              |                                                                                      |
|-----------------------------------------|------------------------------------------|--------------|--------------------------------------------------------------------------------------|
| Lighting Category                       | Indicator                                | Value        | Source                                                                               |
| Global Electricity for All Lighting     | % of global electricity consumption      | ~15–20%      | Lighting estimates often place global use of electricity for lighting in this range. |
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### Detective Prompt:

How does increased nighttime lighting affect energy use and the environment?

## Evidence Card 9 – Satellite Image of Earth at Night

Satellite images reveal bright regions across continents at night, demonstrating how artificial light escapes upward and spreads far beyond its original source.

### Detective Prompt:

What does widespread nighttime brightness suggest about the scale of light pollution?

**No  
Images**

# Part 5-7

## Part 5 – Pathway Tracking: How Does Light Pollution Spread?

Use arrows to show how light pollution moves from source to environment to living things.

Source → Artificial Light → Environment → Living Organisms

Example:

Streetlights → Bright nighttime lighting → Night sky → Disrupted sleep cycles

Your turn:

## Part 6 – Impact Analysis

Impact on Animals

How can light pollution affect animals?

Impact on Humans

Why are scientists concerned about light pollution and human health?

Impact on Ecosystems

How might light pollution affect plants, food webs, and entire ecosystems?

## Part 7 – The Big Question

How did light pollution become such a widespread problem?

Write a clear explanation using evidence from the case.

## Part 5 – Suspect List

Students rank possible sources of light pollution, defend their choices, and determine which human activities are most responsible for the problem.

## Part 6 – Pathway Tracking

Students trace how light pollution moves from everyday sources through the environment and into living organisms, strengthening cause-and-effect understanding.

## Part 7 – Impact Analysis

Students analyze how light pollution affect animals, humans, and ecosystems, using evidence from the case to support their answers.

# Part 8-10

## Part 8 – Claim–Evidence–Reasoning (CER)

### Claim

What is the main cause of light pollution in this case?

### Evidence

List two pieces of evidence from the case that support your claim.

1.

2.

### Reasoning

Explain how your evidence supports your claim.

## Part 9 – Solutions & Action Plan

Personal Actions (Things individuals can do)

Community / School Actions

Government or Industry Actions

## Part 10 – Reflection

One thing that surprised me in this case was:

One change I would make after learning this information is:

## Part 8 – The Big Question

Students synthesize all their learning to explain how light pollution ended up everywhere, using evidence from the investigation.

## Part 9 – Claim-Evidence-Reasoning (CER)

Students write a structured scientific argument, making a claim, supporting it with evidence, and explaining their reasoning.

## Part 10 – Reflection and Solutions

Students propose realistic actions at the personal, school, and government levels, moving from awareness to problem-solving.

# Full Teacher Answer Key

## Teacher Answer Key

### Part 2 - Background Questions

1. What is light pollution?

**Light pollution is the excessive or misdirected use of artificial light at night that brightens the sky, disrupts natural darkness, and interferes with ecosystems and human health.**

2. How is a healthy environment different from one affected by light pollution?

**A healthy environment experiences natural cycles of light and darkness that support animal behavior, plant growth, and human sleep. Environments affected by light pollution remain artificially bright at night, disrupting these natural cycles.**

3. Why do scientists find light pollution difficult to control and reverse?

**Light pollution is difficult to control because artificial lighting is widespread, often unnecessary, and continuously used in cities, homes, roads, and businesses. Poor lighting design allows light to spread far beyond its source.**

### Part 3 - Evidence Log – Key Points

| Evidence # | Key Understanding                           |
|------------|---------------------------------------------|
| 1          | Artificial light blocks natural night skies |
| 2          | Cities contain dense lighting networks      |
| 3          | Migrating birds become disoriented          |
| 4          | Sea turtles follow artificial lights        |
| 5          | Human sleep cycles are disrupted            |
| 6          | Lights stay on even when unused             |
| 7          | Plants respond abnormally to night light    |
| 8          | Night lighting increases energy use         |
| 9          | Light spreads globally from cities          |
| 10         | Poor lighting design worsens pollution      |

### Part 4 - Suspect Ranking

#### High:

- Excessive nighttime lighting
- Unshielded and poorly designed lights

#### Moderate:

- Urban development
- Energy waste

#### Lower:

- Natural light sources

### Part 5 – Pathway Tracking: Sample Correct Pathway

Artificial lighting → Nighttime lights left on → Light escapes upward and outward → Skyglow spreads → Natural darkness reduced → Animal navigation disrupted → Ecosystems affected → Human sleep and health impacted

#### Other acceptable pathways include:

- Streetlights → Unshielded fixtures → Light scattering → Disrupted circadian rhythms → Wildlife behavior changes
  - Urban lighting → Increased energy use → More emissions → Environmental impacts
- ✓ Students should show movement from **human lighting choices** → **environmental spread** → **biological impacts**.

### Part 6 - Impact Analysis

#### Impact on Land & Habitats

Light pollution affects land habitats by disrupting natural night conditions that many plants and animals rely on. Altered light cycles interfere with feeding, breeding, and seasonal behaviors, reducing ecosystem stability.

#### Impact on Water

Artificial lighting along shorelines and waterways confuses aquatic species, especially during breeding and migration. Coastal lighting disrupts natural cues that marine animals use to navigate and survive.

#### Impact on Animals & Humans

Animals experience disorientation, increased predation, and reduced reproduction due to constant light exposure. Humans experience disrupted sleep cycles, reduced melatonin production, and potential long-term health effects.

### Part 7 – Big Question

Light pollution became widespread because artificial lighting is used everywhere, often poorly across cities and communities. Evidence shows that light pollution causes global nighttime illumination (Evidence 9) that spreads far beyond their source (Evidence 10).

### Background Reading: What Is Light Pollution?

Natural darkness is an important part of Earth’s environment. For thousands of years, plants, animals, and humans have relied on predictable cycles of daylight and darkness to regulate behavior, growth, and rest. Today, scientists are increasingly concerned about **light pollution**—the excessive or misdirected use of artificial light at night that brightens the sky, disrupts natural darkness, and interferes with ecosystems and human health.

Light pollution comes from streetlights, buildings, advertising signs, vehicles, and homes that remain lit after sunset. Much of this light is unnecessary or poorly designed. Instead of shining downward where it is needed, light often spreads outward and upward into the sky. This creates **skyglow**, a bright haze over cities that can be seen from far away. As cities grow and lighting increases, natural nighttime darkness becomes harder to find.

Light pollution is increasing worldwide as populations grow and urban areas expand. Because artificial lighting is used every night, even small sources of light can add up to major environmental changes over time.

Healthy environments depend on natural patterns of light and darkness.

### How Is a Healthy Environment Different from One Affected by Light Pollution?

A healthy environment experiences natural day–night cycles that support normal biological rhythms. Animals use darkness to navigate, hunt, rest, and reproduce. Many plants rely on changes in light to signal seasonal growth and dormancy. Humans also depend on darkness for healthy sleep cycles, which help regulate hormones and overall health.

An environment affected by light pollution is very different. Artificial lighting can confuse animals that rely on the stars, moon, or darkness for navigation. Migrating birds, insects, sea turtles, and other species may become disoriented or drawn toward lights instead of natural habitats. Plants exposed to nighttime light may grow or bloom at the wrong times.

Another key difference is balance. Healthy environments can maintain stable rhythms, while light-polluted environments experience constant disruption. This can weaken ecosystems and reduce their ability to recover.

### Why Is Light Pollution So Difficult to Control and Reverse?

Light pollution is difficult to control because artificial lighting is widespread and deeply connected to modern life. Lights are used for safety, transportation, businesses, and homes, and many remain on all night long, even when not needed. Poor lighting design allows light to spread far beyond its original source.

Unlike other types of pollution, light pollution does not stay in one place. Light can travel long distances, meaning that actions in one area can affect ecosystems far away. As cities expand and lighting increases, natural darkness continues to disappear.

Because light pollution is ongoing, widespread, and often overlooked, scientists and communities face major challenges in reducing its impact. Addressing the problem requires changes in how lighting is designed, used, and managed, making light pollution an important environmental issue to understand.

Background Reading

**As a special bonus, I want to send you a few resources that you can use in your classroom tomorrow. Completely free and geared towards what you teach!**



**Just**  **and then choose what you teach!**

*thanks*  
**for your interest  
in this resource!**



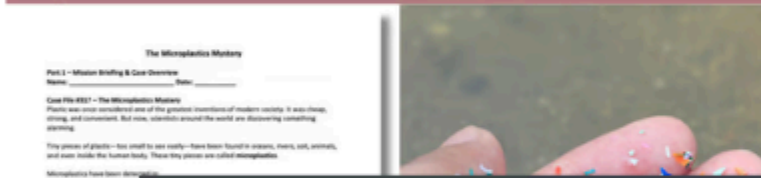
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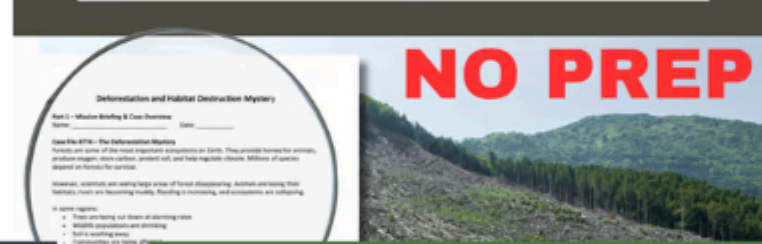
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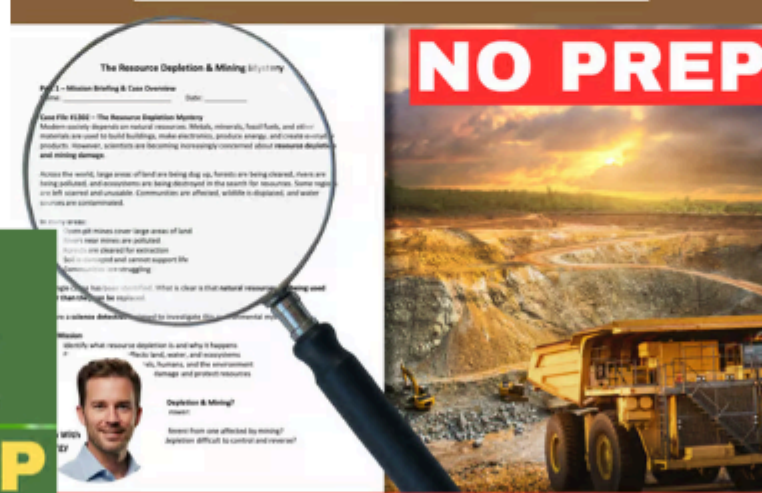
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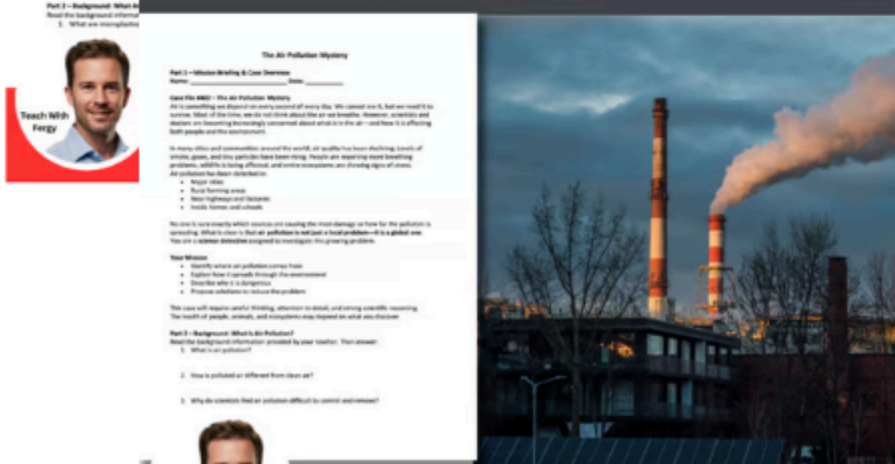
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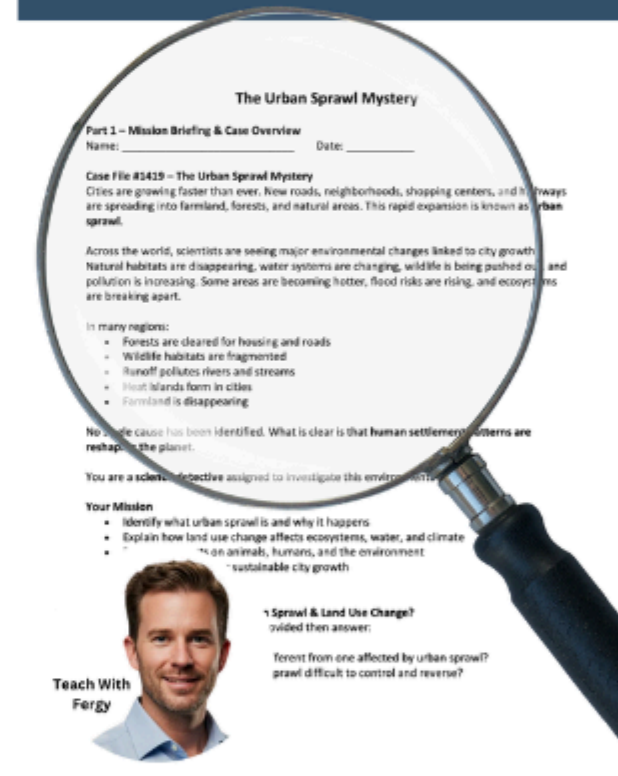
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