

THE FOREVER CHEMICALS MYSTERY

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

NO PREP

The Forever Chemicals Mystery: Unraveling PFAS Pollution

Part 1 – Mission Briefing & Case Overview

Name: _____ Date: _____

Case File #1443 – The Forever Chemicals Mystery

Across the world, scientists are detecting dangerous chemicals in places they were never expected to be found.

Researchers have discovered:

- PFAS chemicals in drinking water
- Contamination near military bases and factories
- PFAS in wildlife and food supplies
- Links between PFAS exposure and human health problems
- Pollution that does not break down over time

These substances are known as **PFAS**, often called *forever chemicals* because they persist in the environment for decades.

Unlike many pollutants, PFAS do not easily break down in soil or water. Once released, they can spread through ecosystems and accumulate in living organisms.

No single community, company, or activity appears to be responsible. Contamination is widespread, long-lasting, and difficult to reverse.

You are a science detective assigned to investigate this environmental mystery.

Your Mission

- Identify what PFAS and forever chemicals are
- How PFAS move through the environment
- How PFAS affect land, water, wildlife, and humans
- Why PFAS pollution is so difficult to control
- How to reduce PFAS contamination

Forever Chemicals (PFAS)?

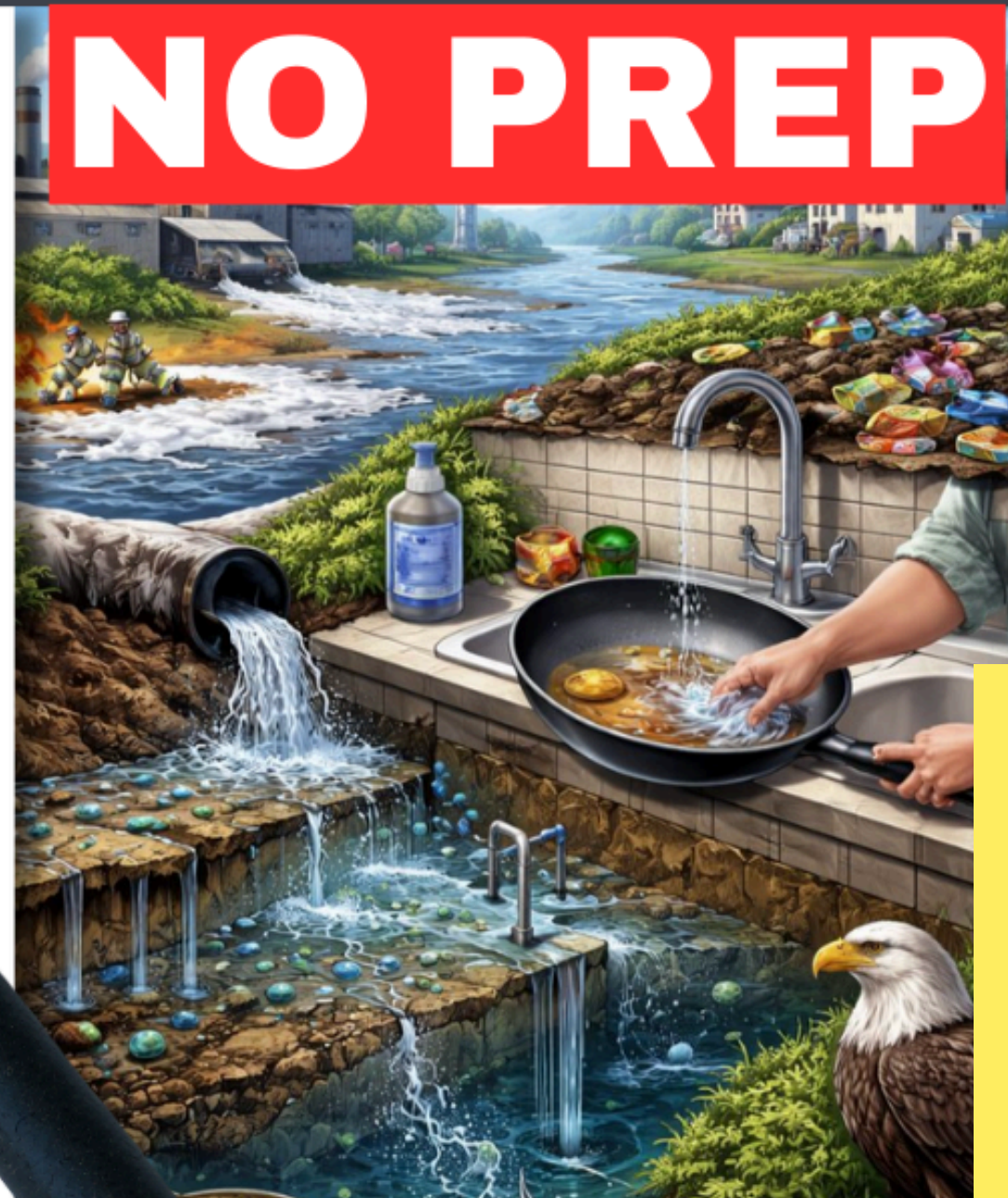
When provided, then answer:

What are PFAS?

How is PFAS pollution different from one affected by PFAS pollution?

Why is PFAS pollution difficult to control and reverse?

Teach With
Fergy



SCROLL
to take a look inside!

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

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 Forever Chemicals.
4. Interrogate suspects (Industrial, consumer products, 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.



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

The Forever Chemicals Mystery: Unraveling PFAS Pollution

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Unlike many pollutants, PFAS do not easily break down and spread through ecosystems and accumulate in living organisms.

No single community, company, or activity appears responsible for the widespread, long-lasting, and difficult to reverse pollution.

You are a science detective assigned to investigate.

Your Mission

- Identify what PFAS and forever chemicals are
- Explain how PFAS move through the environment
- Analyze impacts on land, water, wildlife, and human health
- Determine why PFAS pollution is so widespread
- Propose solutions to reduce PFAS pollution

Part 2 – Background: What Are Forever Chemicals?

Read the background information provided and answer the questions.

1. What are forever chemicals (PFAS)?
2. How is a healthy environment affected by PFAS?
3. Where do scientists find PFAS pollution?

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

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.

Evidence Card 9 – Landfill Leachate

A diagram shows rainwater passing through landfills, creating leachate that can carry PFAS from discarded products into surrounding soil and groundwater.

Detective Notes Prompt: What happens to chemicals when products are thrown away?

Evidence Card 10 – PFAS Persistence Chart

A table shows that PFAS chemicals do not break down naturally and can remain in the environment for decades after their use ends.

PFAS Compound	Approx. Persistence / Half-life	Notes
PFOA	~2.7–~5.1 years (in humans)	Some estimates place environmental persistence much longer than human half-life.
PFOS	~3.4–~5.7 years (in humans)	Builds up over time in organisms.
Some PFAS mixtures in soil	Up to 55–89 years	Certain PFAS degrade very slowly, persisting for decades.
Some long polymers	Possibly hundreds to thousands of years	Some PFAS fragments and polymers may remain effectively forever.

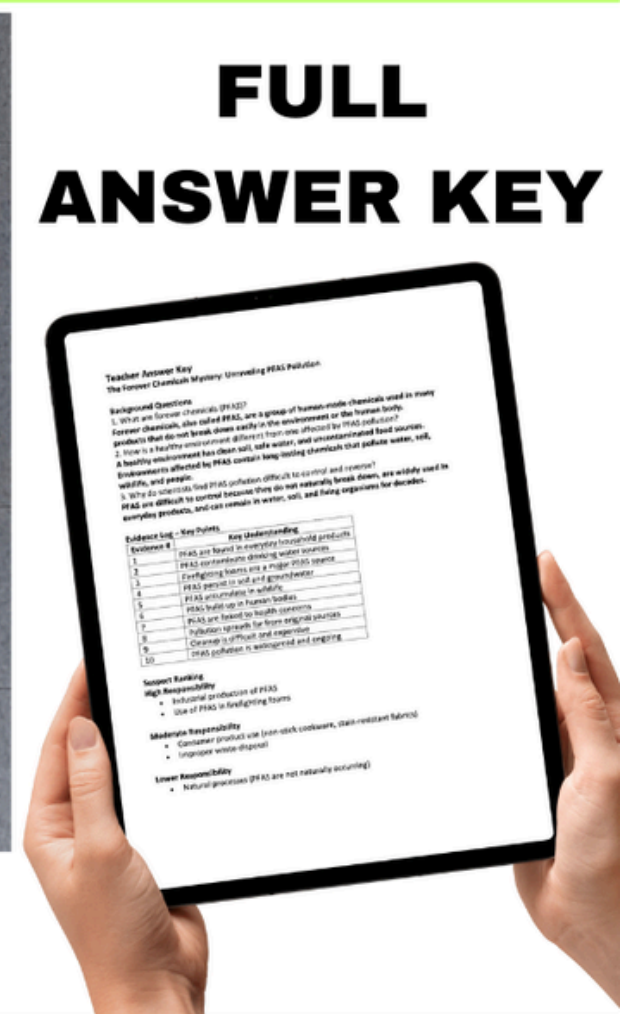
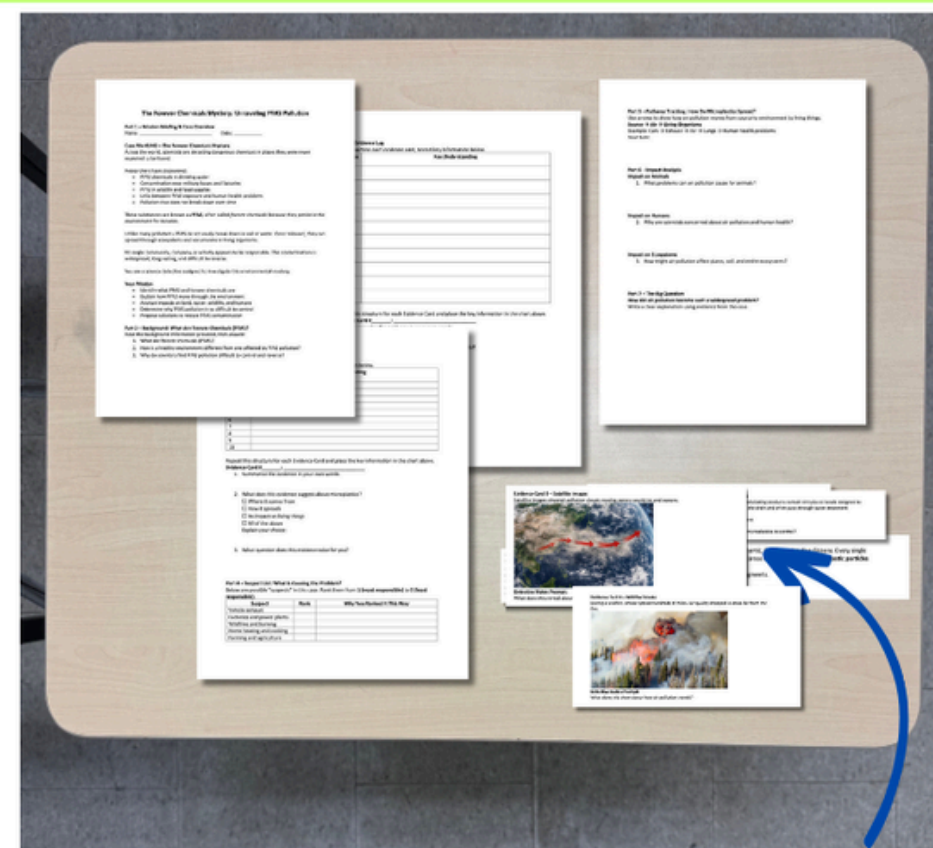
Detective Notes Prompt: Why does persistence make PFAS especially dangerous?

Interpretation of Data

10 Evidence Cards to Determine Culprit

What Will Your Students Learn?

FULLY EDITABLE AND READY-TO-GO INVESTIGATION



“

★★★★★ 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 forever chemicals (PFAS) are and why they persist in the environment.
- ✓ How PFAS move through water, soil, wildlife, and the human body.
- ✓ Why PFAS contamination threatens ecosystems, drinking water, and human health.
- ✓ How everyday products and industrial processes contribute to chemical pollution.
- ✓ 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.

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

MICROPLASTICS MYSTERY DETECTIVE FILE ON PLASTIC POLLUTION & HUMAN IMPACT



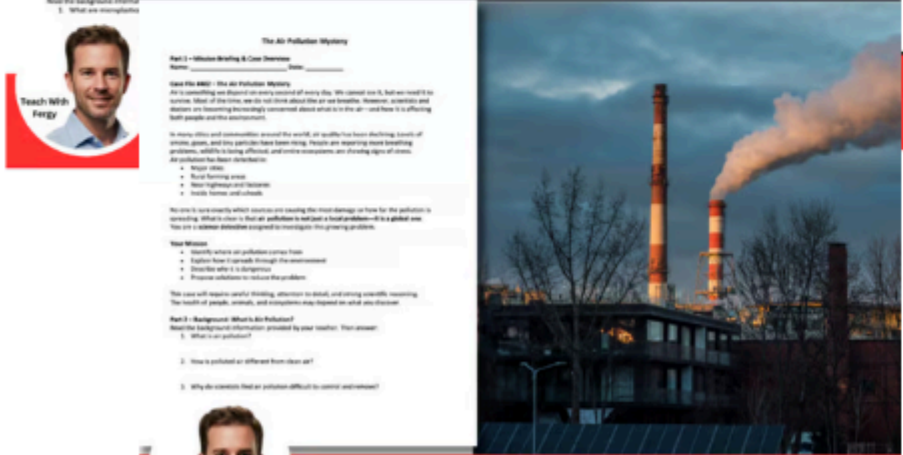
DEFORESTATION & HABITAT DESTRUCTION MYSTERY



THE RESOURCE DEPLETION & MINING MYSTERY



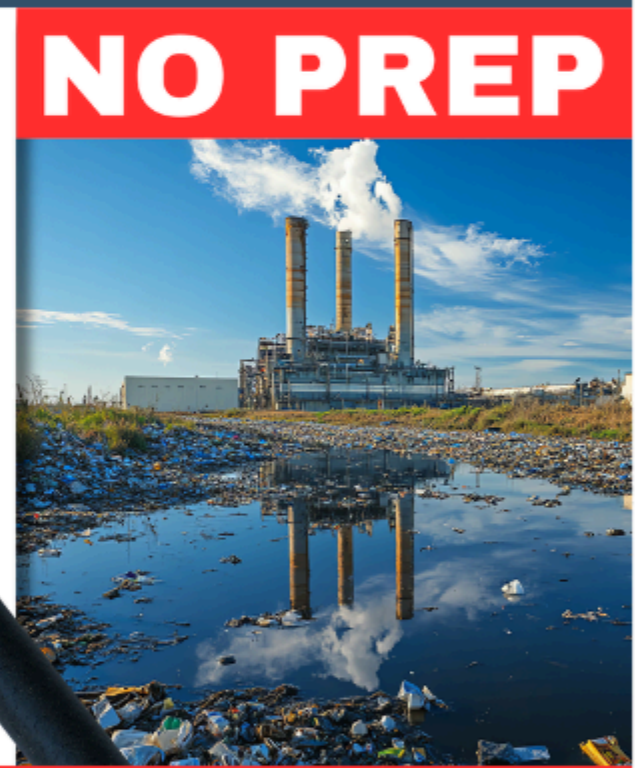
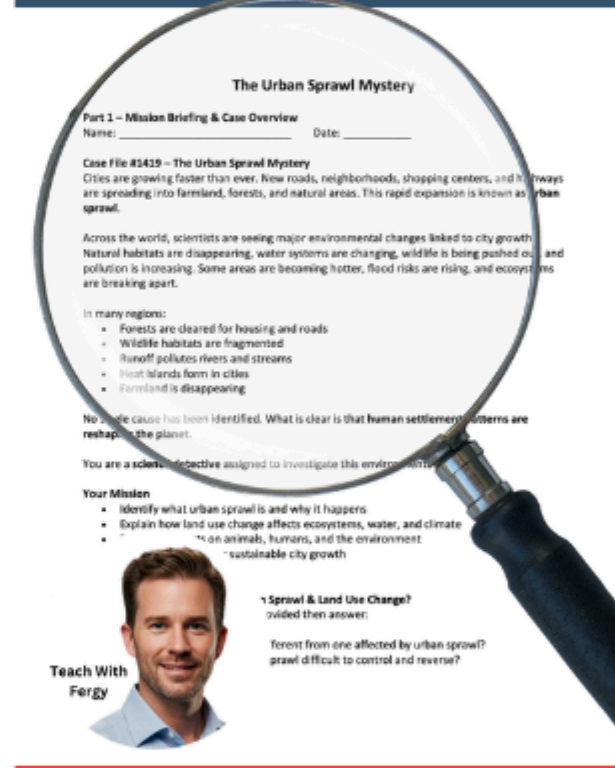
THE AIR POLLUTION MYSTERY DETECTIVE FILE ON AIR POLLUTION & THE ENVIRONMENT



THE INVASIVE SPECIES MYSTERY



DETECTIVE FILE ON HOW HUMANS IMPACT THE ENVIRONMENT



DETECTIVE FILES ON HOW HUMANS IMPACT THE ENVIRONMENT

Plus Many More!
Click Here

Part 1 & 2

The Forever Chemicals Mystery: Unraveling PFAS Pollution

Part 1 – Mission Briefing & Case Overview

Name: _____ Date: _____

Case File #1443 – The Forever Chemicals Mystery

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Unlike many pollutants, PFAS do not easily break down in soil or water. Once released, they can spread through ecosystems and accumulate in living organisms.

No single community, company, or activity appears to be responsible. The contamination is widespread, long-lasting, and difficult to reverse.

You are a science detective assigned to investigate this environmental mystery.

Your Mission

- Identify what PFAS and forever chemicals are
- Explain how PFAS move through the environment
- Analyze impacts on land, water, wildlife, and humans
- Determine why PFAS pollution is so difficult to control
- Propose solutions to reduce PFAS contamination

Part 2 – Background: What Are Forever Chemicals (PFAS)?

Read the background information provided, then answer:

1. What are forever chemicals (PFAS)?
2. How is a healthy environment different from one affected by PFAS pollution?
3. Why do scientists find PFAS pollution difficult to control and reverse?

Part 1 – Mission Briefing & Case Overview

Students are introduced to the forever chemicals 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 are Forever Chemicals?

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 PFAS pollution?
☐ What causes it
☐ Pathway
☐ Its impact on living things
Explain your choice:
- What question does this evidence raise for you?

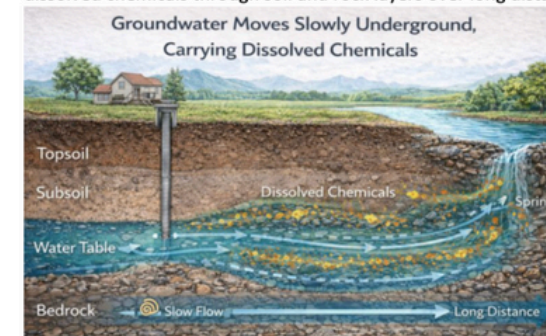
Part 4 – Suspect List: What Is Causing PFAS Pollution?

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

Suspect	Rank	Why You Ranked It This Way
Industrial chemical manufacturing		
Firefighting foam (AFFF) use		
Consumer product use		
Wastewater and landfill leakage		
Natural processes		

Evidence Card 6 – Groundwater Flow Diagram

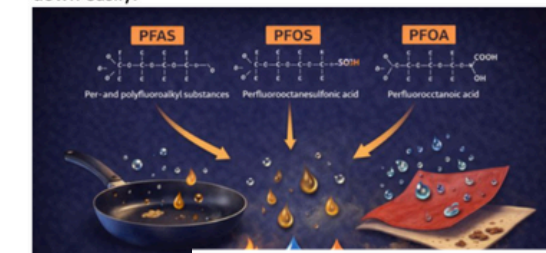
A diagram illustrates how groundwater moves slowly underground, carrying dissolved chemicals through soil and rock layers over long distances.



Detective Notes Prompt: How could underground water spread pollution far from its source?

Evidence Card 3 – Non-Stick Cookware

A diagram shows chemical coatings used on non-stick cookware and stain-resistant products, designed to repel heat, water, and grease without breaking down easily.



Detective Notes Prompt: How could underground water spread pollution far from its source?

Evidence Card 10 – PFAS Persistence Chart

A table shows that PFAS chemicals do not break down naturally and can remain in the environment for decades after their use ends.

Environmental Persistence Data

PFAS Compound	Approx. Persistence / Half-life	Notes
PFOA	~2.7--~5.1 years (in humans)	Some estimates place environmental persistence much longer than human half-life.
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Some PFAS mixtures in soil	Up to 55--89 years	Certain PFAS degrade very slowly, persisting for decades.
Some long polymers	Possibly hundreds to thousands of years	Some PFAS fragments and polymers may remain effectively forever.

Detective Notes Prompt: Why does persistence make PFAS especially dangerous?

Part 4 – Evidence Analysis

Students summarize each piece of evidence, identify what it reveals about forever chemicals, 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

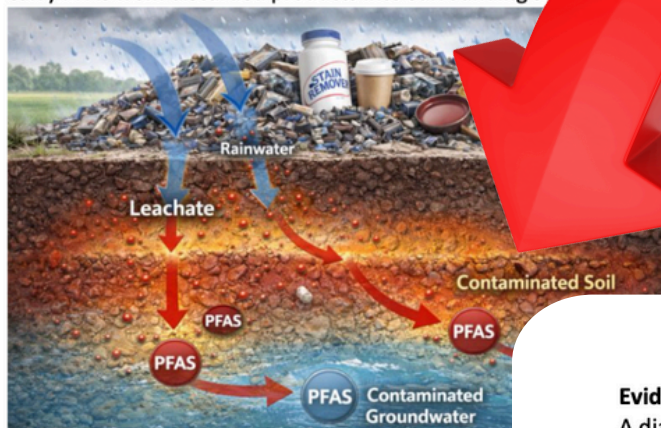
☐ Its impact on living things

3. Explain what question(s) this evidence raises for them?

Images
&
Graphs

Evidence Card 9 – Landfill Leachate

A diagram shows rainwater passing through landfills, creating leachate that can carry PFAS from discarded products into surrounding soil and groundwater.



Detective Notes Prompt: What happens to chemicals when they are thrown away?

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Detective Notes Prompt: Why does persistence make PFAS especially dangerous?

Evidence Card 6 – Groundwater Flow Diagram

A diagram illustrates how groundwater moves slowly underground, carrying dissolved chemicals through soil and rock layers over long distances.

Detective Notes Prompt: How could underground water spread pollution far from its source?

Evidence Card 7 – PFAS in Wildlife

Testing has found PFAS chemicals in fish, birds, and other wildlife living near contaminated areas, showing that these substances build up in living organisms.

Detective Notes Prompt: How might PFAS move through food webs?

Evidence Card 8 – Human Blood Testing

Medical studies show PFAS chemicals present in human blood samples worldwide, even in people with no direct connection to industrial pollution.

Detective Notes Prompt: How could these chemicals enter the human body?

Evidence Card 9 – Landfill Leachate

A diagram shows rainwater passing through landfills, creating leachate that can carry PFAS from discarded products into surrounding soil and groundwater.

Detective Notes Prompt: What happens to chemicals when products are thrown away?

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Detective Notes Prompt: Why does persistence make PFAS especially dangerous?

No
Images

Part 5-7

Part 5 – Pathway Tracking: How Do PFAS Spread?

Use arrows to show how PFAS move through the environment.

Example:

PFAS-containing product → Used by people → Washed or discarded → Enters water or soil →

Moves through groundwater → Enters plants, animals, and humans

Your turn:

Part 6 – Impact Analysis

Impact on Land & Soil

How do forever chemicals affect soil and land?

Impact on Water

How do PFAS affect groundwater, rivers, and drinking water?

Impact on Animals & Humans

How does PFAS exposure affect wildlife and people?

Part 7 – The Big Question

How did PFAS pollution become such a widespread and long-lasting environmental problem?

Use evidence from the case to support your answer.

Part 5 – Suspect List

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

Part 6 – Pathway Tracking

Students trace how forever chemicals move from everyday sources through the environment and into living organisms, strengthening cause-and-effect understanding.

Part 7 – Impact Analysis

Students analyze how forever chemicals 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 the PFAS pollution crisis?

Evidence

List two pieces of evidence from the case.

1.

2.

Reasoning

Explain how your evidence supports your claim.

Part 9 – Solutions & Reflection

Solutions

What actions could help reduce PFAS pollution?

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 forever chemicals 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
The Forever Chemicals Mystery: Unraveling PFAS Pollution

Background Questions
1. What are forever chemicals (PFAS)?
Forever chemicals, also called PFAS, are a group of human-made chemicals used in many products that do not break down easily in the environment or the human body.
2. How is a healthy environment different from one affected by PFAS pollution?
A healthy environment has clean soil, safe water, and uncontaminated food sources. Environments affected by PFAS contain long-lasting chemicals that pollute water, soil, wildlife, and people.
3. Why do scientists find PFAS pollution difficult to control and reverse?
PFAS are difficult to control because they do not naturally break down, are widely used in everyday products, and can remain in water, soil, and living organisms for decades.

Evidence Log – Key Points	
Evidence #	Key Understanding
1	PFAS are found in everyday household products
2	PFAS contaminate drinking water sources
3	Firefighting foams are a major PFAS source
4	PFAS persist in soil and groundwater
5	PFAS accumulate in wildlife
6	PFAS build up in human bodies
7	PFAS are linked to health concerns
8	Pollution spreads far from original sources
9	Cleanup is difficult and expensive
10	PFAS pollution is widespread and ongoing

- Suspect Ranking**
- High Responsibility**
- Industrial production of PFAS
 - Use of PFAS in firefighting foams
- Moderate Responsibility**
- Consumer product use (non-stick cookware, stain-resistant fabrics)
 - Improper waste disposal
- Lower Responsibility**
- Natural processes (PFAS are not naturally occurring)

Sample Correct Pathway
(Students may word this differently)
PFAS-containing products → Use by consumers or industries → Disposal or release → PFAS enter soil and water → Groundwater contamination → Drinking water pollution → Bioaccumulation in animals → Human exposure through water and food
✓ Students should show movement from **human use** → **environmental persistence** → **spread through ecosystems** → **impacts on living organisms**.

Impact Analysis
Impact on Land & Habitats
PFAS contaminate soil when products break down, or firefighting foams are released. Because these chemicals do not degrade, they remain in soil for long periods, damaging habitats and affecting plant growth and soil organisms.
Impact on Water
PFAS easily move through soil into groundwater and surface water. Once in water supplies, they are difficult to remove and can contaminate drinking water, rivers, lakes, and wetlands for many years.
Impact on Animals & Humans
Animals exposed to PFAS may accumulate chemicals in their bodies, affecting growth and reproduction. Humans can be exposed through drinking water, food, or contact with contaminated environments, increasing health risks over time.

Big Question
PFAS pollution became widespread because forever chemicals have been used for decades in many products and industries. Evidence shows contamination in water supplies (Evidence 2) and widespread use in firefighting foams and consumer products (Evidence 1 and 3). Because PFAS persist and spread easily, pollution continues long after their release.

Part 8 – Claim-Evidence-Reasoning (CER)
Claim
The main cause of PFAS pollution is the widespread use of PFAS-containing products in manufacturing processes and consumer products.
Evidence
1. Evidence shows PFAS are found in everyday household products (Evidence 1).
2. Evidence shows PFAS contaminate drinking water sources (Evidence 2).
3. Evidence shows firefighting foams are a major PFAS source (Evidence 3).
Reasoning: Because PFAS do not break down easily, they accumulate in soil, water, and living organisms. The widespread use and disposal of PFAS-containing products leads to long-term environmental contamination and health impacts.

Background Reading: What are Forever Chemicals (PFAS)?
Every day, people use products designed to resist water, grease, heat, and stains. Nonstick cookware, waterproof clothing, food packaging, firefighting foam, and many cleaning products rely on special chemicals to work effectively. Scientists are increasingly concerned about a group of these chemicals known as **forever chemicals**, or **PFAS** (per- and polyfluoroalkyl substances), because of their long-lasting effects on the environment and human health.

PFAS are human-made chemicals that have been used for decades. They are called “forever chemicals” because they do not break down easily. Once released into the environment, PFAS can remain in soil, water, animals, and people for many years. These chemicals can travel through water and spread far from where they were originally used, making contamination widespread.

PFAS can enter the environment during manufacturing, product use, firefighting activities, or disposal. When products containing PFAS are thrown away, burned, or washed, the chemicals can move into soil, rivers, lakes, and groundwater. Drinking water contamination has become one of the most serious concerns related to PFAS pollution.

Healthy environments depend on clean soil, safe water, and balanced ecosystems. In a healthy system, plants and animals are not exposed to harmful chemicals, and people can safely drink water and grow food. Natural processes help ecosystems remain stable and recover from change.

Environments affected by PFAS pollution are very different. Because PFAS do not break down, they build up over time. Soil can become contaminated, water supplies may no longer be safe to drink, and animals can absorb PFAS through food and water. These chemicals can move through food webs, affecting wildlife and eventually humans. Once PFAS are present, ecosystems become weaker and less able to recover.

PFAS pollution is difficult to control and reverse for several reasons. These chemicals are used in many products, which means they are constantly being released into the environment. Even when some uses are reduced, PFAS already present continue to spread. In addition, PFAS can remain in water, soil, and living organisms for decades, making cleanup efforts very challenging and expensive.

Because PFAS pollution is widespread, long-lasting, and closely connected to modern products and industries, scientists and governments face major challenges in protecting ecosystems and human health. Understanding how forever chemicals move through the environment is an important step in addressing this growing global problem.

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!**



 devon@teachwithfergy.com

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ENVIRONMENTAL SCIENCE DETECTIVE MYSTERY BUNDLE

MICROPLASTICS MYSTERY DETECTIVE FILE ON PLASTIC POLLUTION & HUMAN IMPACT



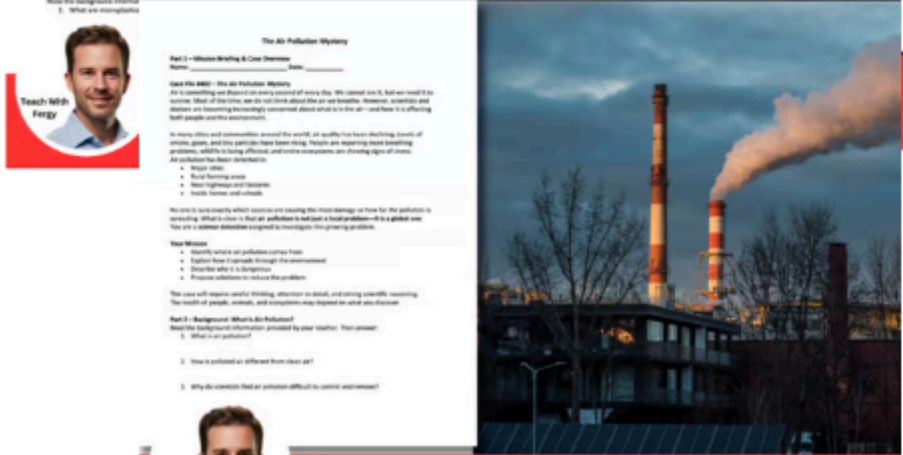
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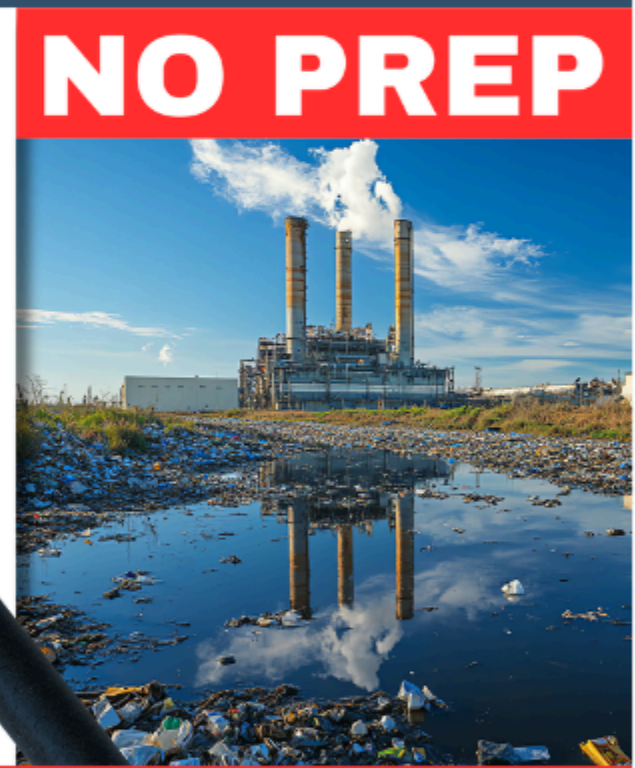
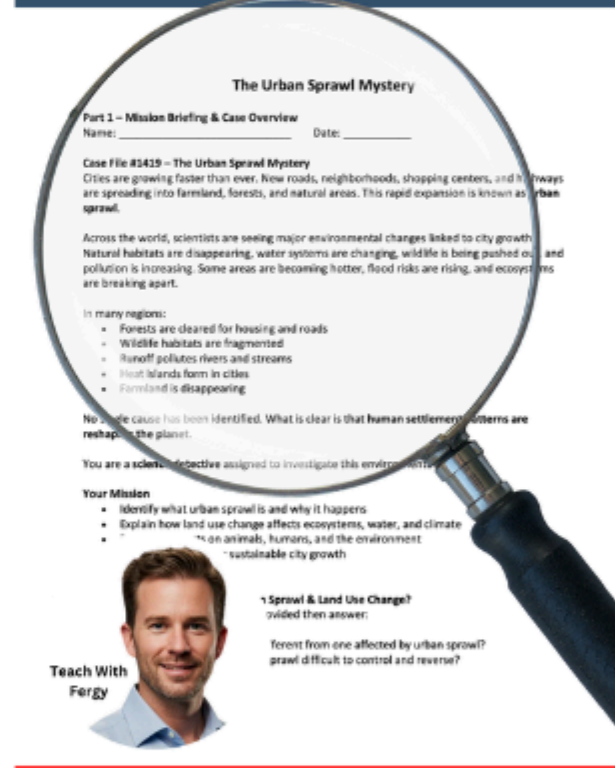
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THE INVASIVE SPECIES MYSTERY



DETECTIVE FILE ON HOW HUMANS IMPACT THE ENVIRONMENT



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