Where does the pollutant come from?

A source is the origin or discharge location of pollution; a pollutant is the substance or energy causing harm. Topic 8.1 distinguishes identifiable point sources from diffuse nonpoint sources.

1. COMPARE THE RELEASE PATTERN

POINT SOURCE

A single, identifiable source.

Examples: a factory discharge pipe, a wastewater outlet or a smokestack.

A specific release location can be investigated and monitored.

NONPOINT SOURCE

Diffuse inputs spread over an area.

Examples: pesticide spraying or pollutants washed from many roads, lawns and fields.

Individual contributions can be difficult to separate.

The category describes the source pattern, not how toxic, visible or large the pollution is. A point source can operate continuously or release pollution only occasionally.

2. THE SAME POLLUTANT CAN HAVE DIFFERENT SOURCES

Example A: nitrogen compounds leave a treatment plant through one outfall: a point source.
Example B: nitrogen fertilizer is washed from many fields across a watershed: nonpoint inputs.
Finding nitrogen in a lake alone does not reveal which source supplied it.

3. FOLLOW THE DESCRIPTION, NOT A SHORTCUT

"Factory" does not automatically mean point source in every scenario: consider the release pathway. "Farm" does not automatically mean nonpoint: a concentrated discharge can be identifiable. Nonpoint means diffuse, not necessarily unknown, harmless or impossible to investigate.

Definitions and examples: College Board, STB-3.A.1 and STB-3.A.2.
Outfalls and concentrated discharges: NOAA, Point Source Pollution.

Scope: College Board AP Environmental Science CED, Topic 8.1, p. 157.

Trace source, pathway and destination

Pollution released on land can move into surface water or groundwater. A watershed connects upstream activities with downstream environments; the place where damage is noticed may not be the source.

1. FOLLOW THREE ILLUSTRATIVE ROUTES

SOURCE	TRANSPORT	RECEIVING ENVIRONMENT
MANY FIELDS	→ Rain carries fertilizer and eroded soil.	→ Stream and downstream lake receive inputs.
PAVED AREAS	→ Runoff picks up oil, trash and particles.	→ Nearby waterways receive runoff.
LEAKING TANK	→ Fuel enters soil and seeps downward.	→ An aquifer may become contaminated.

2. RUNOFF IS NOT THE ONLY PATHWAY

Rain and snowmelt can carry contaminants over land. Water infiltrating the soil can carry dissolved pollutants downward; groundwater flow may spread contamination beyond the original leak. Soil does not remove every contaminant. Atmospheric deposition can also deliver pollutants to land and water.

Useful nuance: urban runoff is a standard diffuse-source example, but runoff collected into an identifiable storm-sewer discharge can be regulated as a point-source discharge. Do not assume every runoff pathway or every storm drain fits the same classification. Nor should a storm drain be assumed to lead to sewage treatment.

Runoff and diffuse inputs: US EPA, Nonpoint Source Pollution.
Subsurface transport: USGS, Contamination of Groundwater.
Collected stormwater: US EPA, NPDES Stormwater Program.

Scope: College Board AP Environmental Science CED, Topic 8.1, p. 157.

Match the response to the source

Extension: identifying the source helps explain where prevention and monitoring should occur. A single outlet can be targeted directly; diffuse inputs usually need coordinated action across the watershed.

1. CONTROL AN IDENTIFIABLE RELEASE

For a wastewater outlet, reduce pollutants in the waste stream, treat the water before discharge and monitor the outfall. A known location makes targeted action possible, but does not guarantee that treatment removes every pollutant or that enforcement and repairs are simple.

2. PREVENT MANY SMALL INPUTS

Use fertilizers and pesticides only as needed; manage manure and pet waste; keep oil and litter out of drains; and stabilize bare soil. Vegetated buffers and suitable stormwater systems can intercept some pollutants before they enter a stream. The response must involve the relevant properties and land uses.

3. MANAGE WATER AS WELL AS POLLUTANTS

Rain gardens, permeable surfaces and other green infrastructure can store, infiltrate or filter stormwater. Reducing runoff can reduce pollutant transport. Performance depends on pollutant type, site conditions, design and maintenance; infiltration is not a universal solution for contaminated land.

4. EXTENSION: CONCENTRATION IS NOT TOTAL LOAD

Illustrative event: runoff contains 2 mg/L of a pollutant and the volume is 50,000 L, assuming a representative concentration.

Mass delivered = 2 mg/L × 50,000 L = 100,000 mg = 0.10 kg
A dilute input can still carry substantial mass when water volume is large. This calculation does not identify its source or establish whether it is safe.

Targeted treatment and monitoring: NOAA, Point Source Pollution.
Source prevention: US EPA, Nonpoint Source Pollution.
Stormwater management: US EPA, About Green Infrastructure.
Concentration versus total inputs: NOAA, Nonpoint Source Pollution.

Scope: College Board AP Environmental Science CED, Topic 8.1, p. 157.