

Aquatic and Terrestrial Pollution

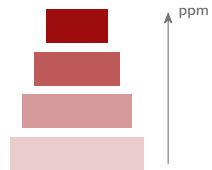
AP Environmental Science ■ Unit 8

AP Environmental Science



What we will cover

- 1 Point and nonpoint sources
- 2 Eutrophication
- 3 Persistent toxins
- 4 Waste and sewage
- 5 Toxicology
- 6 Pollution and health



Point and nonpoint sources

Pollution is sorted by whether we can trace it:

- **point source** 点源: one clear pipe or stack
- **nonpoint source** 非点源: many spread-out places

Nonpoint (farm run-off) is far harder to control – no single pipe to plug.



mangroves

Eutrophication

Too many nutrients set off a chain that suffocates the water:

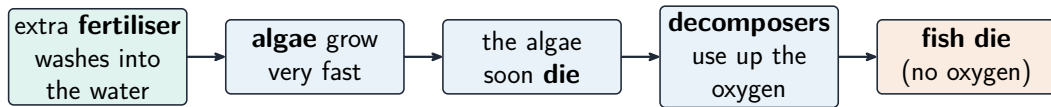
- nutrients run off → **algal bloom** 藻华
- algae die, bacteria decay → **hypoxic** 缺氧 dead zone

Cultural eutrophication 文化富营养化: human phosphorus and nitrogen speed it up.



Algal bloom: nutrient run-off fuels hypoxia

Eutrophication

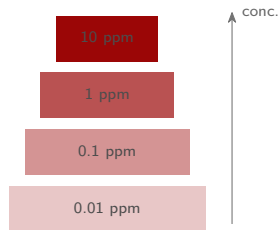


Persistent toxins

POPs 持久性有机污染物 (DDT, PCBs)
resist breakdown 抗分解, so they last
decades and travel far.

- **bioaccumulation** 生物累积: builds up
in one body
- **biomagnification** 生物放大: rises up
the food chain

Top predators 顶级捕食者 (and people who eat them) carry the highest
mercury 汞 dose.



Waste and sewage

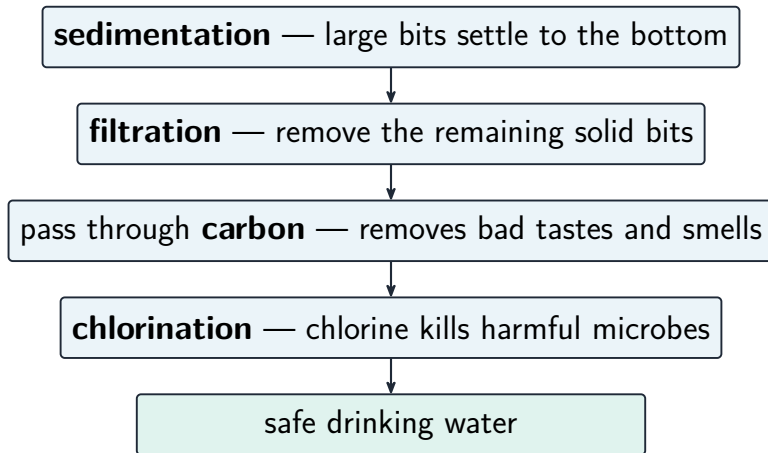
Landfills 垃圾填埋场 bury waste; a sanitary landfill lines the base and captures leachate & methane.

Best order: reduce, reuse, recycle;
compost food scraps.



Landfill: line, capture leachate, manage methane

Waste and sewage



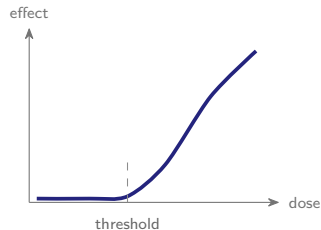
Toxicology

LD₅₀ 半数致死剂量 is the dose that kills half a test group.

- lower LD₅₀ = *more toxic* 毒性
- below the **threshold dose** 阈值剂量: no effect

Acute 急性: one big dose.

Chronic 慢性: small doses over years.



Harm only past
the threshold.

Pollution and health

Harm depends on **dose** 剂量, time, and sensitivity.

- **acute** 急性 vs **chronic** 慢性 effects
- **risk analysis** 风险分析 sets safe limits

Infectious disease 传染病 spreads by **pathogens** 病原体; **environmental change** 环境变化 widens its reach.

dirty water → cholera

air → flu

vectors 病媒: mosquito → malaria

Worked example – reading a BOD result

A river below a sewage outfall has high BOD and almost no fish. Explain the link.

- BOD = the oxygen **decomposer bacteria** use to break down organic waste.
- Sewage feeds the bacteria $\Rightarrow$ they multiply and **respire hard**.
- Dissolved oxygen **crashes** $\Rightarrow$ fish suffocate and only tolerant species survive.
- Further downstream the waste runs out $\Rightarrow$ oxygen recovers $\Rightarrow$ **a classic oxygen sag curve**.

High BOD = dirty water: it means a big oxygen demand, not a lot of oxygen. Fish die of **suffocation**, not poisoning.

Unit 8 – key takeaways

1 Sources

point (one pipe) vs nonpoint
(spread-out run-off)

2 Water harm

eutrophication dead zones; bio-
magnified toxins

3 Waste

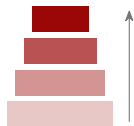
sanitary landfills; re-
duce/reuse/recycle; 3-stage
sewage

4 Toxicology

lower LD₅₀ = more toxic; thresh-
old; acute vs chronic

Check yourself

- 1 Is farm run-off a point or nonpoint source?
- 2 What uses up the oxygen in a eutrophic dead zone?
- 3 Who carries the highest biomagnified toxin dose?
- 4 Does a lower LD_{50} mean more or less toxic?



Answers 1. nonpoint 2. bacteria decomposing dead algae 3. top predators 4. more toxic