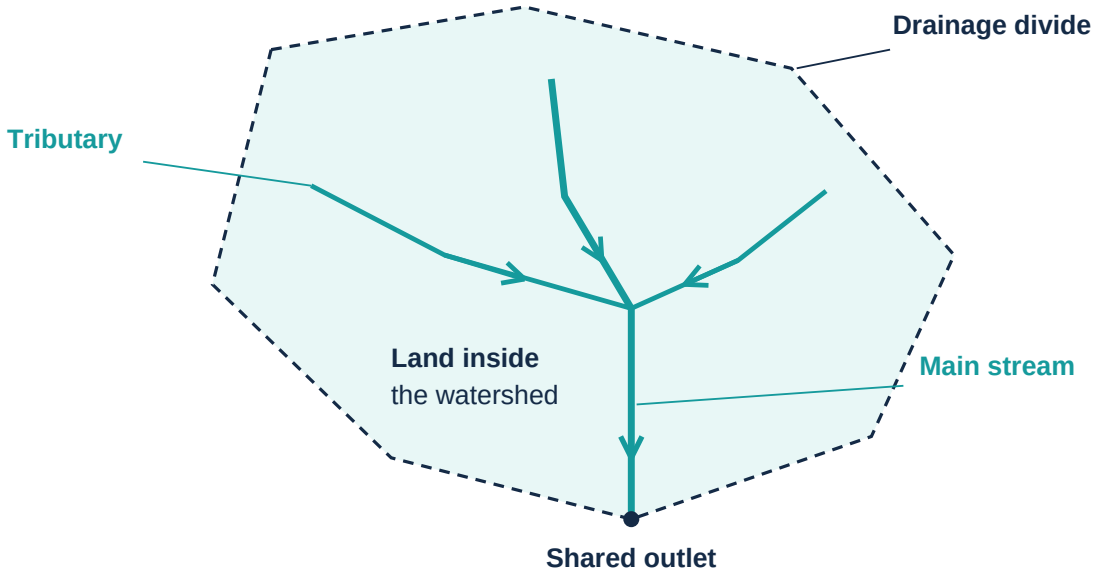
Watersheds: follow the water

A watershed, or drainage basin, is the land area that drains surface water toward a shared outlet. The outlet might be a point on a stream, a lake, or the mouth of a river.

1. READ THE DRAINAGE NETWORK



Plan view; arrows show downstream flow. Schematic, not to scale.

2. A DIVIDE IS A BOUNDARY, NOT A RIVER

Ridges and other high ground commonly separate neighboring drainage basins. Surface water on opposite sides flows toward different outlets. Choose the outlet first, then trace the surrounding high ground to outline the upstream drainage area. The river occupies the low channel; its watershed includes the surrounding land.

3. SMALL WATERSHEDS NEST INSIDE LARGER ONES

A tributary drains its own smaller basin. Where tributaries join the main stream, their drainage areas become part of the larger downstream watershed. Moving the selected outlet farther downstream can include additional land. Watershed boundaries follow drainage patterns, not necessarily city or state borders.

Definition, divides and contributing land: USGS, Watersheds and Drainage Basins.
Outlet-based drainage areas and nested boundaries: USGS, Drainage Area.

Scope: College Board AP Environmental Science CED, Topic 4.6, p. 85.

Describe the watershed

Use all six characteristics named in Topic 4.6: area, length, slope, soil, vegetation types, and divides with neighboring watersheds. Each adds different information.

1. SIX CHARACTERISTICS TO LOOK FOR

Area	Land enclosed by the drainage boundary, often in square kilometers. More area receives more total rain for the same rainfall depth.
Length	A measure of basin extent or flow-path distance. State the method: basin length is not automatically the length of a winding stream.
Slope	Change in elevation over horizontal distance. Steeper ground generally moves overland runoff faster, all else equal.
Soil	Texture, structure, permeability and existing moisture affect infiltration. Saturated or compacted soils can generate more runoff.
Vegetation	Plant cover intercepts rainfall; roots and litter can slow flow, stabilize soil and promote infiltration. Vegetation type and cover matter.
Divides	Topographic boundaries determine which land drains toward the selected outlet and which drains into adjoining basins.

2. WORKED EXAMPLE: SLOPE IS NOT AREA

A straight hillslope transect falls from 220 m to 100 m over a horizontal distance of 2,000 m.

Slope (%) = elevation drop / horizontal distance x 100

= (220 - 100) / 2,000 x 100 = 6%

Use matching distance units. This is the slope along one transect, not the average slope of the whole watershed. Area must be measured separately.

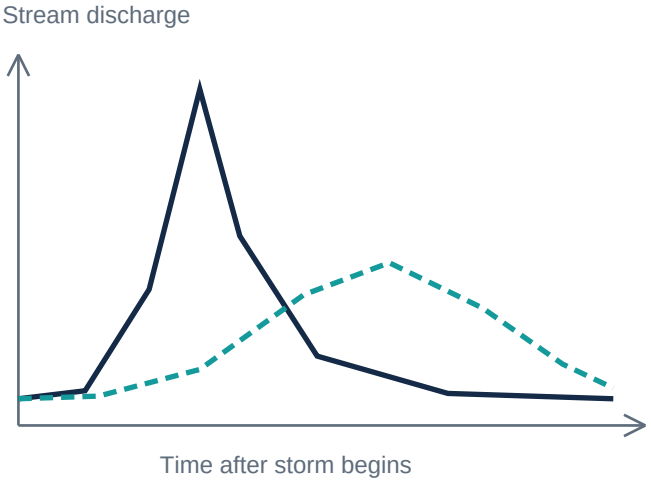
Six required watershed characteristics: College Board, ERT-4.F.1.
Slope, soil saturation and vegetation: USGS, Watersheds and Drainage Basins.

Scope: College Board AP Environmental Science CED, Topic 4.6, p. 85.

Explain the runoff response

Applied connection: watershed characteristics influence how quickly stormwater reaches a stream and what it carries. Compare watersheds under the same storm before attributing a difference to land cover.

1. MORE PAVEMENT CAN MEAN A SHARPER PEAK



Paved / rapid drainage

Solid: earlier, higher peak.

Vegetated / permeable

Dashed: later, lower peak.

Illustrative comparison only; actual responses depend on the whole watershed.

2. TRACE THE WATER PATH

Infiltration is entry into soil; surface runoff moves over the land. Some infiltrated water is stored or used by plants, while some may recharge groundwater and later feed streams. Impervious surfaces restrict infiltration, and drains can route water rapidly to channels. Intense rain or already-wet soil can also increase runoff.

3. UPSTREAM LAND USE AFFECTS DOWNSTREAM WATER

Runoff can transport sediment from exposed soil, nutrients from fields and lawns, and oil from roads. Diffuse inputs across the landscape are nonpoint-source pollution. Maintaining vegetation and reducing directly connected impervious area can slow delivery and reduce some pollutant loads; no single measure removes every contaminant.

A larger basin is not automatically more polluted or more flood-prone. Consider rainfall, travel paths, storage, soils and land use together.

Water pathways and nonpoint pollution: USGS, Surface and Overland Water Runoff.
Impervious cover, drainage connection and flow: EPA, Urbanization - Stormwater Runoff.

Scope: College Board AP Environmental Science CED, Topic 4.6, p. 85.