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Landforms of Erosion and Deposition: Rivers, Glaciers, Coasts and Deserts

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Landforms of Erosion and Deposition: Rivers, Glaciers, Coasts and Deserts

Rivers, ice, waves and wind never stop shaping the land. Each agent carves its own signature landforms, from river gorges to desert dunes.



A barchan dune in the Sperrgebiet desert, Namibia. Barchans form where wind direction stays steady and sand supply is limited. Photo: Plastic pony, via Wikimedia Commons, CC BY-SA 4.0.

Five agents, five landform families

Match each landform to the force that carved it

01
Running Water

Gorges, meanders, oxbow lakes, floodplains and deltas.

02
Groundwater

Karst caves, sinkholes, stalactites and stalagmites.

03
Glaciers

Cirques, horns, aretes, moraines, eskers and drumlins.

04
Waves and Wind

> Sea stacks, spits, lagoons, and five types of sand dune.

GorgeA deep, steep-sided valley of similar width from top to bottom.
Karst topographyA landscape shaped by groundwater dissolving soluble rock like limestone.
CirqueA steep-walled basin cut by ice at the head of a glacial valley.
BarchanA crescent-shaped sand dune with its points trailing downwind.

Rivers, Groundwater and Ice at Work

Must Know

Fluvial Landforms: Rivers at Work

- A **gorge** is a deep, steep-sided valley of similar width top to bottom. A canyon looks similar but is wider at the top than the bottom, in step-like layers. India's own Gandikota Canyon, cut by the Pennar River in Andhra Pradesh, is a well-known exam example.
- In hilly terrain, a river can cut straight down through a meander loop instead of shifting sideways, forming an incised meander. Where a river later cuts into its own old floodplain, it leaves stepped river terraces standing on either bank.
- Rivers on gentle slopes curve into loops called meanders. Sediment piles up as a point bar on each bend's inner, slower bank, while the river erodes the outer, faster bank. When a loop gets cut off from the main channel, it becomes a stranded, curved oxbow lake.
- A floodplain forms where a river deposits fine sediment beyond its banks during floods. Natural levees are low ridges of coarser deposits that build up right along the riverbank.
- An alluvial fan forms where a river suddenly drops its coarse load on reaching flatter ground. A delta is the same idea, but where a river

meets the sea, like the Nile River does at its own famous delta.

- A river landscape ages through three stages. In youth, streams are few, with shallow V-shaped valleys. In maturity, many streams cut deep valleys with sharp divides. In old age, few streams remain and floodplains grow wide.

> **Quick check 1.** Q1. True or False: A canyon is a valley of roughly equal width from top to bottom, while a gorge has step-like, wider-at-the-top sides. *(True or False?)* See answer ↓

Karst Topography and Glacial Landforms

- Karst topography develops only in soluble rock, like limestone, where groundwater dissolves the rock over time. It is named after the Karst region of the Balkans.
- Sinkholes are the most common karst feature: closed depressions that form where rock has dissolved from below, by slow sinking or sudden collapse of the ground above. Caves form along bedding planes, with stalactites hanging from the ceiling and stalagmites rising from the floor. Where a stalactite and a stalagmite meet, they fuse into a single column called a pillar.
- Among karst depressions, a **polje** is the largest, far bigger than a sinkhole, a swallow hole, or the mid-sized uvala.
- A **cirque** is a deep, steep-walled basin cut by ice at the head of a glacial valley, often holding a small lake called a tarn. Where three or more cirques cut into one peak, a sharp horn forms, like the Matterhorn; a narrow ridge between two cirques is an arete.
- Moraines are ridges of debris dropped by a glacier. An esker is a winding ridge left by a stream that once flowed under the ice, and a drumlin is a smooth, spoon-shaped hill of till. Deep glacial valleys

flooded by the sea become fjords, like Norway's own Geirangerfjord, and explored further in our dedicated Fjords article.

Quick check 2. Q2. True or False: Among sinkhole, uvala, swallow hole and polje, the polje is the largest karst landform. *(True or False?)* See answer ↓

Quick check 3. Q3. True or False: A cirque, a steep-walled basin cut by ice at the head of a glacial valley, often holds a small lake called a tarn. *(True or False?)* See answer ↓

Think it through, before reading on. A cirque, a sinkhole and a gorge are all depressions or valleys cut into rock. Yet exams never confuse them with each other. What is the one clue that instantly tells you which agent carved a given landform?

Show the explanation

Look at the shape and setting, not just the fact that rock has been removed. A gorge is a long, narrow, steep-sided channel with a river still flowing through it, so its agent is running water. A sinkhole is a closed, roughly circular depression with no outlet on the surface, usually in limestone country. Rain draining into it goes underground, and sometimes a small surface stream even disappears into it. Its agent is **groundwater** dissolving soluble rock from below. The ground above the cavity then sinks slowly or collapses suddenly. A cirque is a bowl-shaped basin carved into a mountainside at high altitude, often with a small lake in its hollow once the ice has melted, so its agent is a glacier. Each landform carries the fingerprint of how it formed, in its shape, its location and its surrounding rock, and that fingerprint is exactly what an exam question is testing.

Coasts, Deserts and the Exam Angle

Good to Know

Coastal and Desert Landforms

- Waves pounding a rocky coast carve steep sea cliffs. As the cliff retreats, it leaves a flat wave-cut terrace of rock debris in front of it. When a sea cave's roof collapses, an isolated pillar of rock left standing offshore becomes a sea stack.

- A bar is a ridge of sand parallel to the coast; a **spit** is a bar attached at one end to the land. When a spit or bar closes off a bay, it traps a lagoon behind it. India's rocky west coast favours erosion features, while its low, sedimentary east coast favours deposition like deltas.
- A pediment is a gently sloping rock floor cut back at the foot of a mountain. As pediments grow and the mountain shrinks, an isolated rocky remnant called an inselberg is left standing, a pattern also visible across much of the Sahara Desert.
- A **barchan** is a crescent-shaped dune with its points trailing downwind, forming where wind direction stays steady on fairly flat ground. A seif is like a barchan with only one wing, formed when wind direction shifts; a parabolic dune is the reverse shape, anchored by vegetation instead of trailing free.
- Longitudinal dunes form as long ridges running parallel to a steady wind, where sand supply is scarce. Transverse dunes run perpendicular to the wind instead, where sand is abundant.

> **Quick check 4.** Q4. True or False: A barchan is a crescent-shaped sand dune with its points trailing downwind, forming where wind direction stays steady. *(True or False?)* See answer ↓

> **Quick check 5.** Q5. True or False: A spit is a sand ridge attached at one end to the land, and it can trap a lagoon behind it. *(True or False?)* See answer ↓

Remember the pattern. Learn each landform grouped by the agent that made it, not as one long mixed list, since exams love testing exactly that match.

Quick Q&A

What tells you a gorge and a canyon apart?

A gorge has similar width throughout; a canyon is wider at the top, in step-like layers.

What is the largest karst depression?

A polje, far bigger than a sinkhole, swallow hole, or uvala.

What landform often holds a small lake called a tarn?

A cirque, the steep-walled basin a glacier cuts at a valley head.

What traps a lagoon behind it on a coast?

A spit, or a bar, when it closes off a bay.

📝 Exam Point of View

🔗 Related Topics

- **Fjords: Glacial Formation and the World's Most Scenic Coastlines**
- **The Sahara Desert**
- **The Nile River**

- **Inside the Earth: Crust, Mantle, Core and the Rocks**

✅ MCQ on Landforms of Erosion and Deposition

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1. A crescent-shaped sand dune with its points trailing downwind is called a:

A. Drumlin

B. Barchan

C. Seif

D. Longitudinal dune

See answer ↓

2. What is the main difference between a gorge and a canyon?

A. A canyon is wider at the top than the bottom; a gorge is similar in width throughout

B. A gorge only forms in limestone

C. A gorge is always deeper than a canyon

D. A canyon has no river flowing through it

See answer ↓

3. A deep, steep-walled basin cut by ice at the head of a glacial valley, which often holds a lake called a tarn, is a:

A. Cirque

B. Drumlin

C. Moraine

D. Esker

See answer ↓

4. Among sinkhole, uvala, swallow hole, and polje, which karst landform is the largest?

A. Sinkhole

B. Swallow hole

C. Polje

D. Uvala

See answer ↓

5. A ridge of sand attached at one end to the land, which can trap a lagoon behind it, is called a:

A. Sea stack

B. Wave-cut terrace

C. Spit

D. Fjord

See answer ↓

Answer Key

1. **B.** A barchan is a crescent-shaped dune with points trailing downwind, forming where wind direction is steady and sand supply is limited. ↑ Q1
2. **A.** A gorge is a deep valley of roughly equal width top to bottom, while a canyon is wider at the top with step-like sides. ↑ Q2
3. **A.** A cirque is a steep-walled basin carved by glacial ice at the head of a valley, and it often holds a small lake called a tarn after the ice melts. ↑ Q3
4. **C.** A polje is the largest karst depression landform, much bigger than an uvala, swallow hole, or sinkhole. ↑ Q4
5. **C.** A spit is a bar of sand or shingle attached at one end to the coast; when it or a bar closes off a bay, it traps a lagoon behind it. ↑ Q5

Quick-check answers

1. **False.** ↑ 1
2. **True.** ↑ 2
3. **True.** ↑ 3
4. **True.** ↑ 4
5. **True.** ↑ 5

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