

Oxbows


Oxbows are special kinds of loops in a meandering river.

Because they have narrow necks, oxbows are often cut through and oxbow lakes are created.

Q1. Use these diagrams to explain how oxbow lakes form.



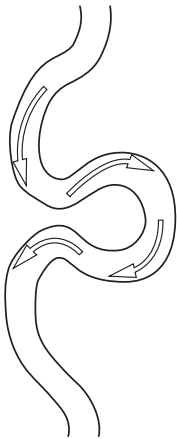
Stage 1




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Stage 2



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Stage 3



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Answers

Q1. Stages 1 to 3. These are essay questions for which there is no single answer, but students should relate their answers to the features they see in the diagrams. See the background information and page 20 of The River Book.

Background support

Sometimes meanders become very looped and are known as oxbows. The region between two meanders is reduced to a 'neck' of land. If erosion erodes the neck, the river cuts off one of its loops. Such abandoned loops often remain as 'oxbow lakes' until fine sediment settling out in their calm waters finally fills them in.

Meanders are a dynamic feature of a river. If an oxbow is cut off, a new meander will begin to grow nearby to maintain the average river pattern appropriate to the size of river and its gradient.

Oxbows (probably named after the shape of the halter used on ox-ploughs) are among the most memorable feature of a floodplain, but they can be hard to find. This is because the looping meander bends required before cutoffs can occur require special conditions for their formation. The Mississippi River has many of the best examples.

The question may arise as to when a meander is an oxbow. The answer is when the meander produces a narrowed neck of intervening land.

In general, rapid changes in meander shapes and cutoffs occur when rivers are flowing down relatively steep courses. On gentle gradients the river moves around much more aimlessly, there is little erosive energy for change, and curved reaches of the channel are not actively scoured on their outer edges. On relatively steep paths (by which we might mean just a few centimetres per kilometre on very large rivers!), the energy for erosion is greater.

There are many names for oxbow lakes, of which 'billabong', used in Australia, is possibly the most colourful.

Oxbows are just part of a continual process of change, whereby meandering increases the river length until it is unsustainable for its environment, then cutoffs occur, shortening the river again, and allowing nearby meandering to increase. This repeating cycle is part of the complex sequence of processes that eventually produce floodplains.

Across the curriculum (for both meanders and oxbows)

Using this material you can link:

- ▶ Physical processes, such as the way that centrifugal force moves material flowing in a curve to the outside, and also makes the water level higher;
- ▶ The historical movement of meanders, and so county, and even state, boundaries change with time;
- ▶ The way that meanders and oxbows can severely disrupt navigation, and so prompt people to try to cut the oxbows through;
- ▶ The way that meanders can be found in all materials and even over flat surfaces. Meanders are thus a result of the hydraulic nature of water, not a feature of the bed over which they flow;
- ▶ The way that suitable materials can be used for models;
- ▶ The way that meanders and oxbows contain both sediment and water;
- ▶ The places you might choose to build a river harbour (outside bank with deep water), and the problems this might bring (continual erosion of harbour site);
- ▶ The places you might choose as a fording or bridging point (straight stretch not bends with deep water), and how this has affected the nation's routeway system.