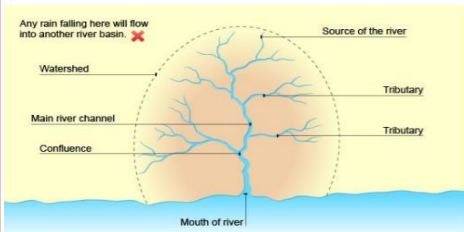


# River Landscapes

## DRAINAGE BASIN

An area of land drained by a river and its tributaries.



### What are the Features of Drainage basins?

**Watershed:** Highland or hill that separates one drainage basin from another

**Confluence:** the point where two rivers/streams meet/join

**Tributary:** a smaller stream or river that joins a bigger stream or river

**Source:** the starting point of a river or stream

**Mouth:** the point where a river leaves the drainage basin

## PHYSICAL PROCESSES

### Weathering:

Weathering is the breakdown of rock by natural processes.

There are three key weathering processes that affect river valley's:

Mechanical (Freeze- thaw)	Water enters cracks in rocks and freezes when temperatures drop below zero; the water expands, putting pressure on the rock. This process of expanding and contracting causes the rock to break into smaller pieces.
Chemical (acid rain)	Slightly acidic rainfall, polluted by factories and vehicles, reacts with weak minerals causing them to dissolve and decay.
Biological weathering	The roots of plants grow in cracks and split the rock apart. Or burrowing animals break up rocks.

### Mass movement:

Mass movement is the transfer of material down the valley/slope due to gravity.

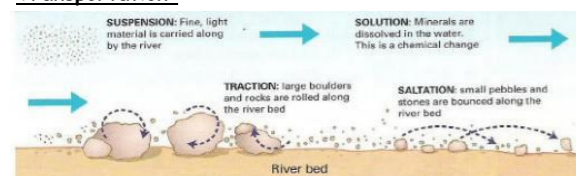
Soil creep	Individual particles soil move slowly down a slope due to gravity
Slumping	At the bottom of a valley slope the river erodes the valley side. Material above slides downwards rotating as it does often after times of heavy rain saturating the rock and soil making it heavy
Sliding	A slide happens when a section of soil or rock suddenly gives way and moves down a slope. The material moves as a single mass along a slippery zone. The slippery zone is often made up of wet sediment.

### River erosion:

The action of water wearing away rocks and soil. There are four key processes of erosion.

Abrasion	Load is dragged by water wearing away the banks and bed of the river and causes most erosion
Attrition	Load collides with load and wears down/breaks up
Solution	Weak acid dissolves rocks such as Limestone
Hydraulic action	The shear force of the water trapping air in cracks fracturing the rock on the banks and bed of the river

### Transportation:

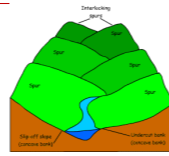


### Deposition:

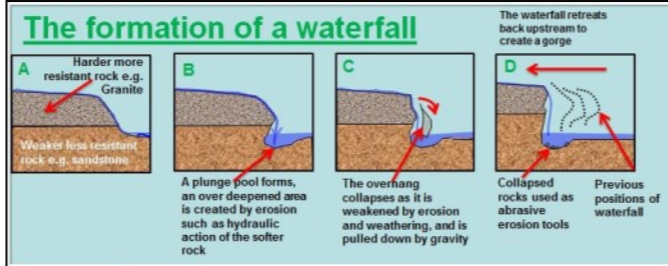
When a river loses its energy deposition occurs. Heaviest material is deposited (dropped) first.

## INTERLOCKING SPURS—UPPER COURSE

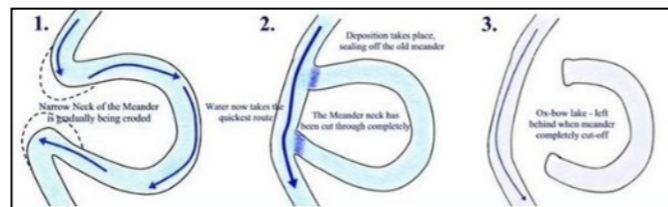
At the source rivers have less power and flow around hard rock valley slopes (spurs) instead of eroding them. The spurs then inter-lock from one side to the other.



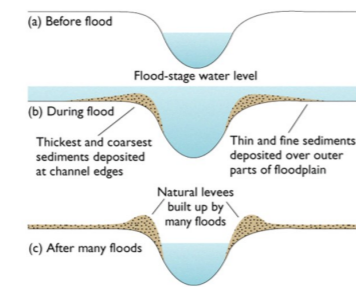
## WATERFALLS—UPPER COURSE



## MEANDERS AND OX BOW LAKES—MIDDLE COURSE

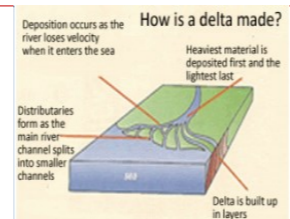


## LEVEE AND FLOODPLAINS—LOWER COURSE



## DELTA—LOWER COURSE

Water speed decreases near the sea. Material is deposited. Over time this builds up to create an area of new land - a delta. Deltas Because the river is now flowing slowly the channel fills up with sediment and the river splits into different streams, distributaries.



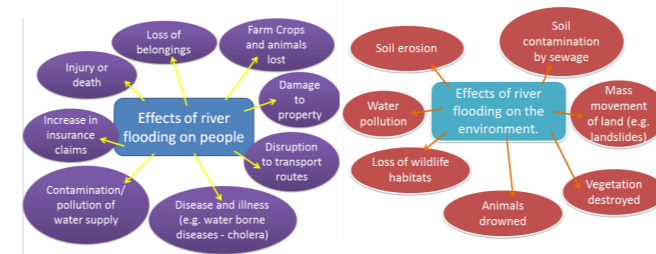
## THE COURSE OF THE RIVER

The long profile of a river changes according to the Bradshaw model



Upper course	Middle course	Lower course
Shallow Narrow Slow flowing Little erosive power Angular rocks/sediment Large sediment size Small discharge	Reasonably deep Reasonably wide Increasing velocity Some erosive power Some angular and rounded rocks/sediment Average sediment size Increasing discharge	Deep Wide Fast flowing Great erosive power Rounded rocks/sediment Small sediment size Large discharge

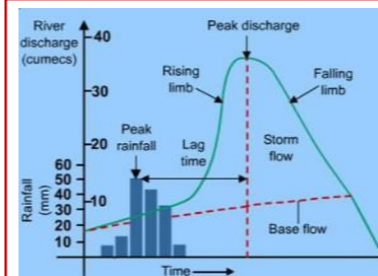
## IMPACTS OF RIVER FLOODING



## HOW DOES THE ENVIRONMENT AGENCY MANAGE FLOOD RISK?

The Environment Agency makes Catchment Management Plans, manages rivers and land use, controlling developments in flood plains, building flood defences as well as helping people to prepare and giving warnings.

## PHYSICAL FACTORS AND HUMAN ACTIVITIES AFFECT STORM HYDROGRAPHS



Rising limb = indicates discharge increases a few hours after rainfall. Peak flow = Discharge reaches max levels.

Recession (falling) limb = indicates a fall in discharge once the water has passed downstream.

Lag time = time from peak rainfall to peak discharge

A hydrograph is a way of showing how a river responds to a rainfall event showing the relationship between rainfall (mm) and discharge (m<sup>3</sup>/cumecs).

	Drainage basin A	Drainage basin B
Precipitation	Heavy, rapid rainfall or snow melt	Gentle rainfall or snow melt
Geology	Impermeable rock	Permeable rock
Drainage basin size	Small, with lots of tributaries, so rain reaches river quickly	Wide and elongated drainage basin, so rain reaches river slowly
Soil, slopes	saturated, impermeable rocks such as clays; steep slopes	Permeable rock allowing infiltration, such as sandy materials; gentle slopes
vegetation	Deforested area, very little interception	Large woodlands intercept large amounts of rainfall
Towns/cities	Urban areas, Impermeable surfaces	Rural areas, permeable surfaces
Antecedent conditions	Heavy rainfall, saturated land	Little rainfall, capacity to soak up rain

## HUMAN AND PHYSICAL CAUSE OF FLOODING

Human Causes	Physical causes
<ul style="list-style-type: none"> <li>urbanisation, because towns and cities have more impermeable surfaces</li> <li>deforestation, because removing trees reduces the amount of water intercepted and increases run-off</li> <li>Climate change, leading to increased snow melting</li> <li>Climate change leading to extreme weather conditions</li> <li>Poor dam construction</li> </ul>	<ul style="list-style-type: none"> <li>heavy rainfall/long periods of rain</li> <li>snowmelt</li> <li>steep slopes</li> <li>impermeable rock (doesn't allow water through)</li> <li>very wet, saturated soils</li> </ul>

## INCREASING UK FLOOD RISK

Flooding is a natural occurrence but since 1998 severe flooding has occurred somewhere in the UK every year sometimes twice in a year. The main reasons for this are as follows:

1. Increased population = more housing. Building on the cheaper land of the flood plain has put 2.3 million houses at risk of flooding.
2. Land use changes with urban developments = more impermeable surfaces which increases surface run-off.

## RIVER MANAGEMENT

**Channelisation**  
 The river channel may be widened or deepened allowing it to carry more water. Channelisation increases the capacity of the channel and the velocity at which the water can travel, allowing water to drain from the area quickly.  
 A river channel may be straightened so that water can travel faster along the course. This takes place along the River Thames in Reading. Channelisation is a long lasting method that doesn't require any additional maintenance. Altering the river channel may lead to a greater risk of flooding downstream, as the water is carried there faster.  
 Channelisation can make the river look unnatural and is visually intrusive.

**Dams and reservoirs**  
 Dams are large, concrete walls built across the width of a river. The Dam and Reservoir is an example situated along the River Trent in Yorkshire. A dam is a very effective and long lasting method of river management. This water stored behind the dam can be released to turn a turbine and generate hydroelectric power. The dam can stop the natural migration of fish. When the dam is built settlements and agricultural land may be lost when the river valley is flooded to form a reservoir. Building a dam can be very expensive.

**Floodplain Zoning**  
 This is when local authorities and the national government introduce policies to control urban development close to or on the floodplain. Floodplain zoning ensures that lower value land uses are closer to the river so that if it does flood, damage is limited. Enforcing planning regulations and controls may be harder in LICs.  
 Floodplain zoning restricts building at the side of the River Thames within Reading Town Centre. A very cheap way of reducing the risk of damage to property, as nothing has to be built. There can be resistance to restricting developments in areas where there is a shortage of housing.

**Washlands**  
 Low value areas either side of the river that are allowed to flood naturally if river levels rise. These low value areas are allowed to flood in order to protect areas downstream that may have settlements or higher value land.  
 Washlands are present at the side of the River Thames near to Reading. Land will be lost and become unproductive. It will then become marshland. Large areas of land are taken over and cannot be built on. Very cost effective as nothing is built.

## WHAT DECISIONS ARE MADE BEFORE BUILDING FLOOD DEFENCES?

Because flood defences are so expensive the EA works out which would be most effective with limited environmental damage by conducting an impact assessment (residents, business, transport, wildlife and habitats) and a cost-benefit analysis (value for money). In 2000, severe flooding of the river Severn affected 140 in Bewdley so local residents and businesses want to improve the flood defences. The EA worked a number of possible options including the costs and

benefits:	Costs	Benefits
Do nothing therefore £0	Maintenance of banks £0.2m	Little benefit except £0 spent
Storage dams 1km upstream £15m	Demountable aluminium flood defences, 2.7m high costing £6.9m	Bank collapse prevented
		Volume of water retained wouldn't prevent a 100yr event £0.5m
		150 properties protected, 24hr warning required £7.5million