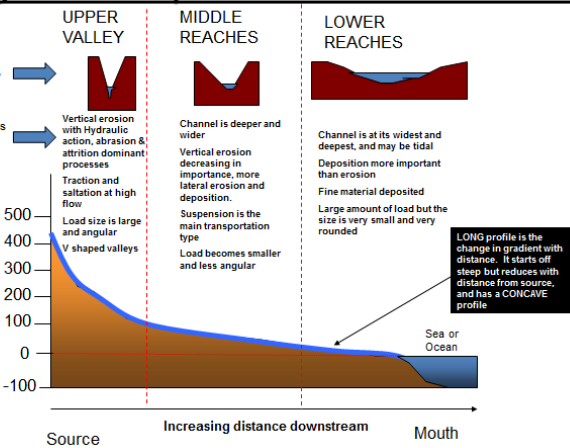


1. Rivers and river valleys

Long and cross profiles on a TYPICAL river



2. Fluvial Processes

Erosion

Term	Definition
Hydraulic action	Flowing water erodes the bed and banks. Found at waterfalls and meanders
Corrosion	Scraping of rivers bed by particles of rock – like sandpaper
Attrition	Rounding and smoothing of rock as they rub against each other
Dissolution	Dissolving of soluble chemicals esp. limestone
Downwards erosion	Downwards erosion – common in upper course
Sideways erosion	Sideways erosion – common in middle and lower course
Transportation	
Rolling	Rolling of large rocks
Bouncing	Bouncing of small rocks
Suspension	Particles suspended in water
Dissolution	Chemicals dissolved in river

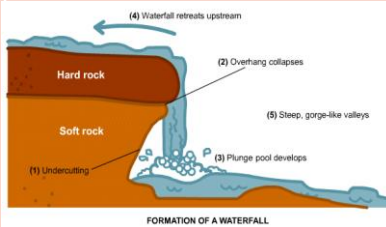
3. River Landforms

Upper course (erosion)

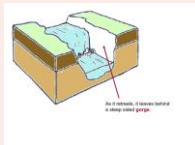
Interlocking spurs water flows around fingers of harder rock. Vertical erosion deepens the valley



Waterfalls – a step in the long profile, usually over a fault. Water flows over hard rock. A plunge pool forms at the bottom due to hydraulic erosion.



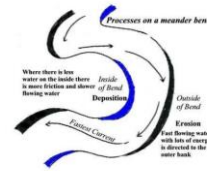
Gorges – as a waterfall retreats the cap rock collapses and the process starts again forming a steep sided gorge



Middle Course (erosion and deposition)

Meanders – bends in the river. Where water flows fastest erosion happens on the outside curve. On the inside curve, water is slower so deposition occurs forming a slip off slope

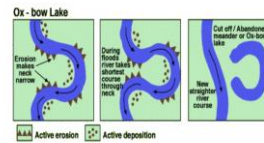
Meander Formation



Oxbow Lakes Where the neck of the meander is breached during flood leaving the old meander curve as a lake

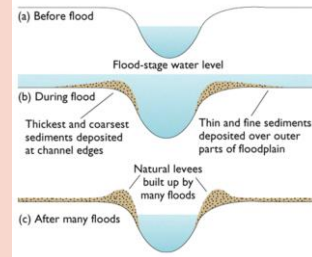
Ox-bow Lake Formation

Can you look at the diagram & explain the formation of ox-bow lakes?

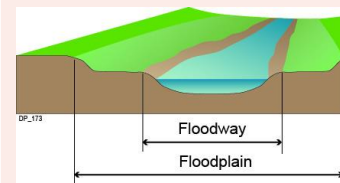


Lower course (deposition)

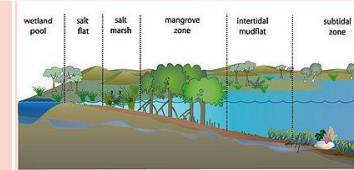
Levees – Raised banks formed after a river floods



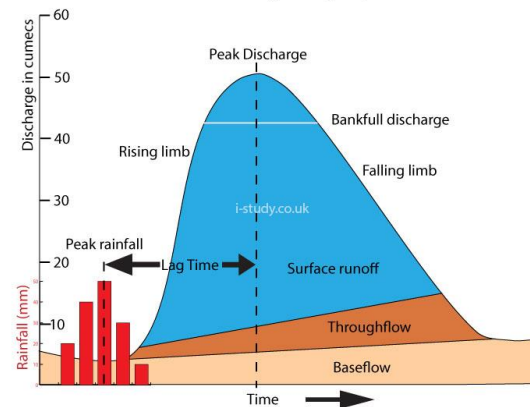
Floodplains – wide areas of flat land – often good for farming



Estuaries – Where the river meets the salt water of the sea. Salt marshes are common.



Storm Hydrograph



Unit 1





UK Physical Landscapes - Rivers



4. Factors affecting flooding

Physical	Human
<ul style="list-style-type: none"> Precipitation Geology Relief 	<ul style="list-style-type: none"> Farming Urbanisation Deforestation

5. River Management Strategies

Hard Engineering			
Strategy		Benefits	Costs
Dams & Reservoirs – Concrete control river flow by creating artificial reservoir		<ul style="list-style-type: none"> Can be used for HEP or tourism Creates new wetland habitats Creates source of drinking water V effective 	<ul style="list-style-type: none"> V expensive (Kielder dam cost £167 million) Social costs of displacement Reservoirs silt up Can lead to conflict over water rights eg Nile
Channel Straightening – water flows out of area faster		<ul style="list-style-type: none"> Insurance premiums may fall Effective Navigation improved 	<ul style="list-style-type: none"> Lead to flooding downstream High maintenance unattractive
Bankment – artificially using concrete to deepen channel		<ul style="list-style-type: none"> Increased capacity for carrying water Creates walkways (eg London) New river bank habitats 	<ul style="list-style-type: none"> Expensive Looks artificial More serious flooding if embankment fails (New Orleans)
Relief Channels – new channels to pass towns		<ul style="list-style-type: none"> Opportunities for recreation (fishing and walking) New aquatic habitats creates Insurance premiums reduced 	<ul style="list-style-type: none"> V expensive – Jubilee River cost £110 million) Regular maintenance needed Habitats disturbed

Soft Engineering			
Flood Warnings. - monitoring to allow floods to be avoided		<ul style="list-style-type: none"> Sustainable Low cost Focus on helping people 	<ul style="list-style-type: none"> People may not respond Need for monitoring equipment
Floodplain Zoning – not building in flood areas		<ul style="list-style-type: none"> Low cost Conserves water meadows for recreation and wildlife 	<ul style="list-style-type: none"> Restricts economic development Housing shortage Hard to implement retrospectively
Planting trees – Trees increase absorption and slow flooding		<ul style="list-style-type: none"> Creates habitats Natural Low cost 	<ul style="list-style-type: none"> Loss of farmland Loss of economic use of land Not totally effective

6. UK River example –The river Tees



- Location and Background
- Located in the North East of England
 - Its source is high in the Pennine hills (height 893m)
 - Flows for 128km to the North Sea at Middlesbrough

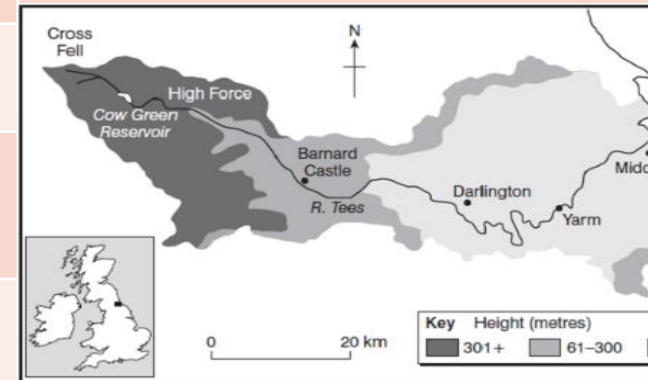
Key Features

Geomorphic Processes

Upper – Features include V-Shaped valley, rapids and waterfalls. High Force Waterfall located close to Forest-in-Teesdale drops 21m and is made from harder Whinstone and softer limestone rocks. Gradually a gorge has been formed.

Middle – Features include meanders and ox-bow lakes. The meander near Yarm encloses the town.

Lower – Greater lateral erosion creates features such as floodplains & levees near Darlington. Mudflats at the river's estuary.



7. Boscastle, Cornwall Flood August 2004

Flash flood caused millions of pounds of damage and disrupted tourism. In response the old bridge was replaced by a taller one to allow debris to pass under, the river channel was deepened and widened, the embankment was strengthened, a flood wall was built, dead trees and vegetation were removed, the car park was raised and a gauge was installed to monitor water levels

Social Issues	Economic Issues	Environmental issues
<ul style="list-style-type: none"> Residents lives disrupted during building of new defences Many residents think new bridge is ugly and not in keeping with village Safer Will protect against a 1 in 75 year flood only 	<ul style="list-style-type: none"> Homes and businesses less at risk of flooding Scheme cost over £4 million. Some ideas rejected on basis of cost 	<ul style="list-style-type: none"> Vegetation in river habitats monitored and biodiversity improved New channel has been engineered to be more natural

