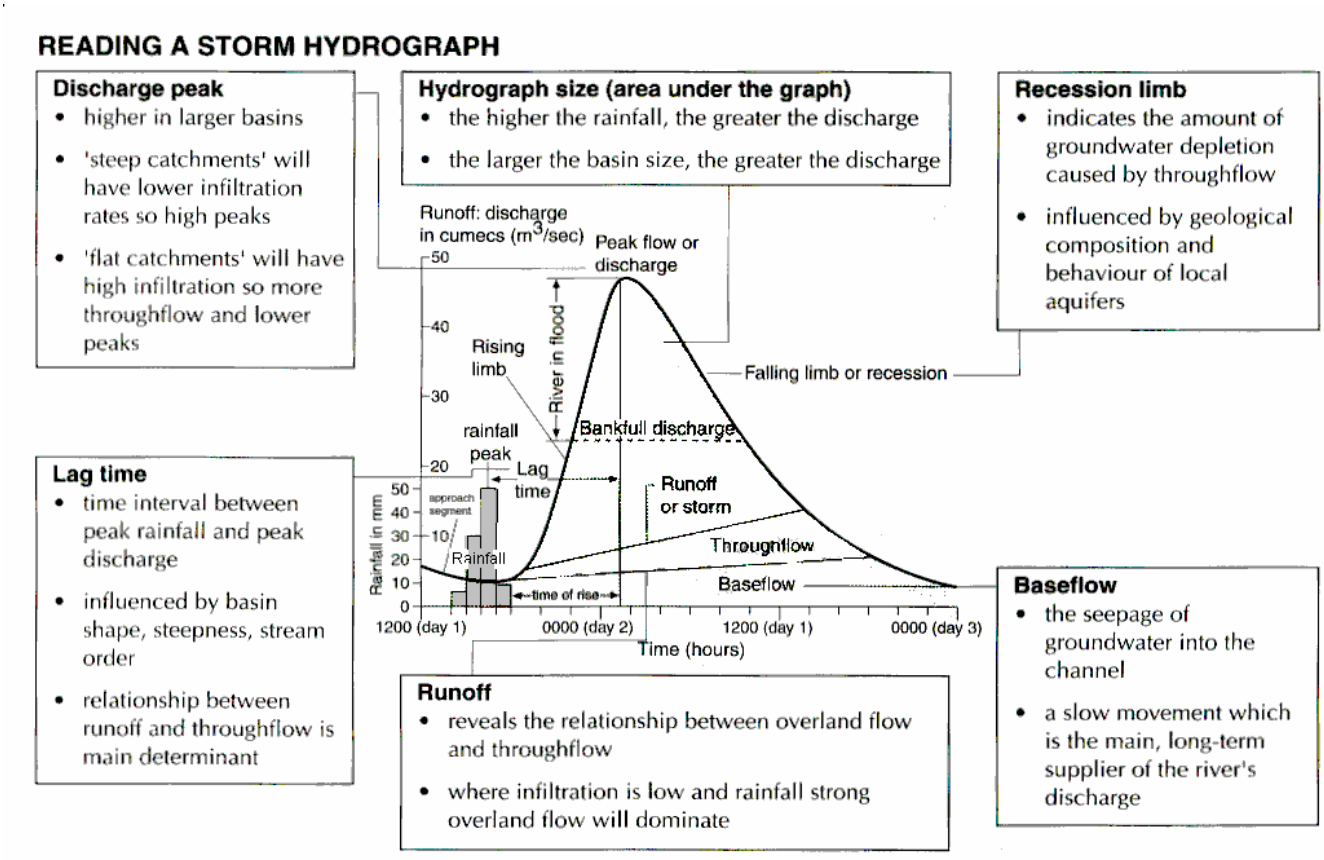
AS Geography 1.2 Fluvial Environments *Student Notes*

The characteristics of hydrographs and the physical and human factors influencing them, such as weather, rock type, soil, relief, vegetation, antecedent conditions and human activity.

Hydrographs may be single storm responses or longer term representations. You should know elements such as lag time, peak discharge, rising limb, recessional limb and base flow.



You should appreciate that there are both spatial and temporal differences in the patterns of hydrographs.

Spatial differences may be caused by:

- **Differences in Geology.** Permeable rocks, such as chalk, limestone or sandstone, increase the percolation rate so a lower proportion of the rainfall becomes surface runoff. This lowers the discharge peak and increases the lag time as can be seen in Wycombe's River Wye. With impermeable rocks, such as granite or clay, percolation is reduced and surface runoff is increased, reducing the lag time and increasing the discharge peak. This is seen on the River Lyn as the sandstones of Exmoor are impermeable.

- **Differences if relief.** Runoff rates will increase with higher relief, thus decreasing the discharge peak and reducing the lag time. Slopes on Exmoor are steep, particularly in the incised lower parts of the Lyn Valleys close to Lynmouth.

- **Differences in drainage basin shape.** Elongated drainage basins, which receive an even covering of rainfall, will have a lower but longer discharge peak. Water from the furthest point in the drainage basin from the outlet takes longer to arrive than water that falls near the outlet. If the drainage basin is round, discharge will reach the outlet at once giving a shorter lag and a higher peak discharge. The Lyn drainage basin is much more round that that of the Wycombe Wye which is elongate.

- **Differences in drainage basin size.** Small drainage basins, like that of the Lyn, will have a short lag time and may have a higher peak discharge. The Lyn drainage basin is substantially smaller tan the Thames Basin.

- **Differences in soil type.** Soils on Exmoor are generally thin with relatively low levels of moisture holding organic matter. Infiltration rates are low and soils rapidly reach their field capacity. Clay soils on the river Thame in Oxfordshire also encourage short lags and high peaks.

- **Differences in drainage density.** This is strongly influenced by geology and antecedent events. Drainage density will be higher on impermeable rocks and after prolonged periods of rainfall. Drainage density (measured in km of river per km^2) is high on Exmoor.

- **Differences in land use.** A woodland or forest landscape will increase interception and evapotranspiration leading to much lower levels of surface runoff. Grassland will be less effective at intercepting and will lead to lower levels of evapotranspiration. Urban areas have very low levels of interception and evapotranspiration and are designed to increase surface runoff. Therefore rivers in urban areas have a short lag and a high discharge peak.

Temporal differences may be caused by:

- **Differences in the duration of rainfall**. Prolonged rainfall leads to an increased risk of soils reaching their field capacity. In other words the rate if infiltration is exceeded and the soil becomes saturated. This results in higher rates of surface runoff. Many flood events in Britain have been preceded by periods of prolonged rainfall.

- **Differences in the intensity of rainfall.** Heavy rainfall may exceed he infiltration capacity leading to overland flow or surface runoff leading to a rapid rise in river levels.

- **Snowmelt or Glacial Meltwater.** Snow and glacial ice have little impact on discharge until they melt. Rapid melting in spring, often combined and accelerated by rainfall can lead to a rapid rise in discharge.

- **Seasonal changes in vegetation.** There is generally less evapotranspiration in winter, particularly if the trees are deciduous. Deciduous trees will also have very low interception rates so surface runoff will increase.

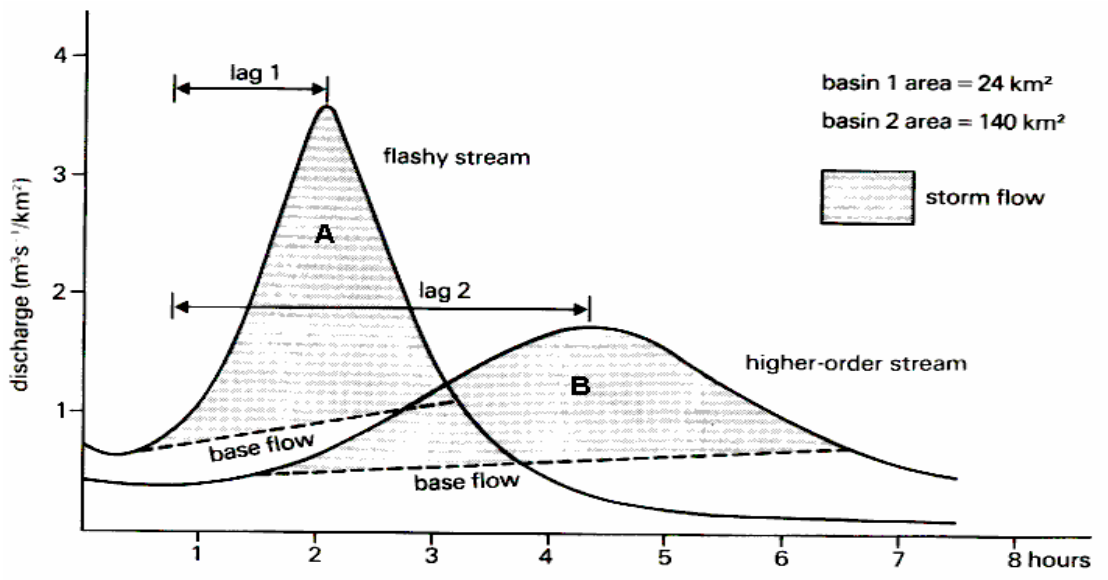
- **Differences in temperature and evapotranspiration rates**. Warmer conditions in summer will increase evaporation and evapotranspiration rates, reducing surface runoff.

- **Human Activity.** In the summer months, there is a higher demand for domestic water. Water abstraction and increased storage in reservoirs can reduce river discharge and will lower the discharge peak.

Note that a stream that is prone to high peaks and shot time lags is said to have a "**flashy regime**" Those with the greatest variation in discharge tend to occur in semi-arid regions or close to the margins of glaciers. Such rivers often have **braided channels.**

The graphs below show two different hydrographs (A and B) following a single storm rainfall event. Decide which graph represents:

Graph	Condition	Graph	Condition
	A period of steady rain		A short torrential downpour
	A gently sloping valley		A steep sided valley
	An area with low drainage density		An area with high drainage density
	A Chiltern stream		An Exmoor stream
	A stream in a mature deciduous wood		An area of heathland vegetation
	An area with saturated soils.		An area with soils below their field capacity.
	A mild spell after a period of snowfall		A mild period in early Autumn
	A deciduous wood in summer		A deciduous wood in winter
	An elongated drainage basin		A round shaped drainage basin
	A rural area.		An urban area.



Temporal and Spatial Variation in Discharge in the River Wye following a storm. *Link the graphs and map using the locations of the gauging stations (where discharge is measured).*