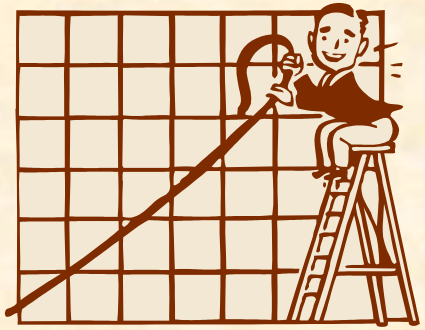
Construction

And

Analysis

Of

Hydrographs



Hydrograph

Record of River Discharge over a period of time

River Discharge

= cross sectional area X rivers mean (average) velocity

(at a particular point in its course)

Storm Hydrographs

Show the change in discharge caused by a period of rainfall

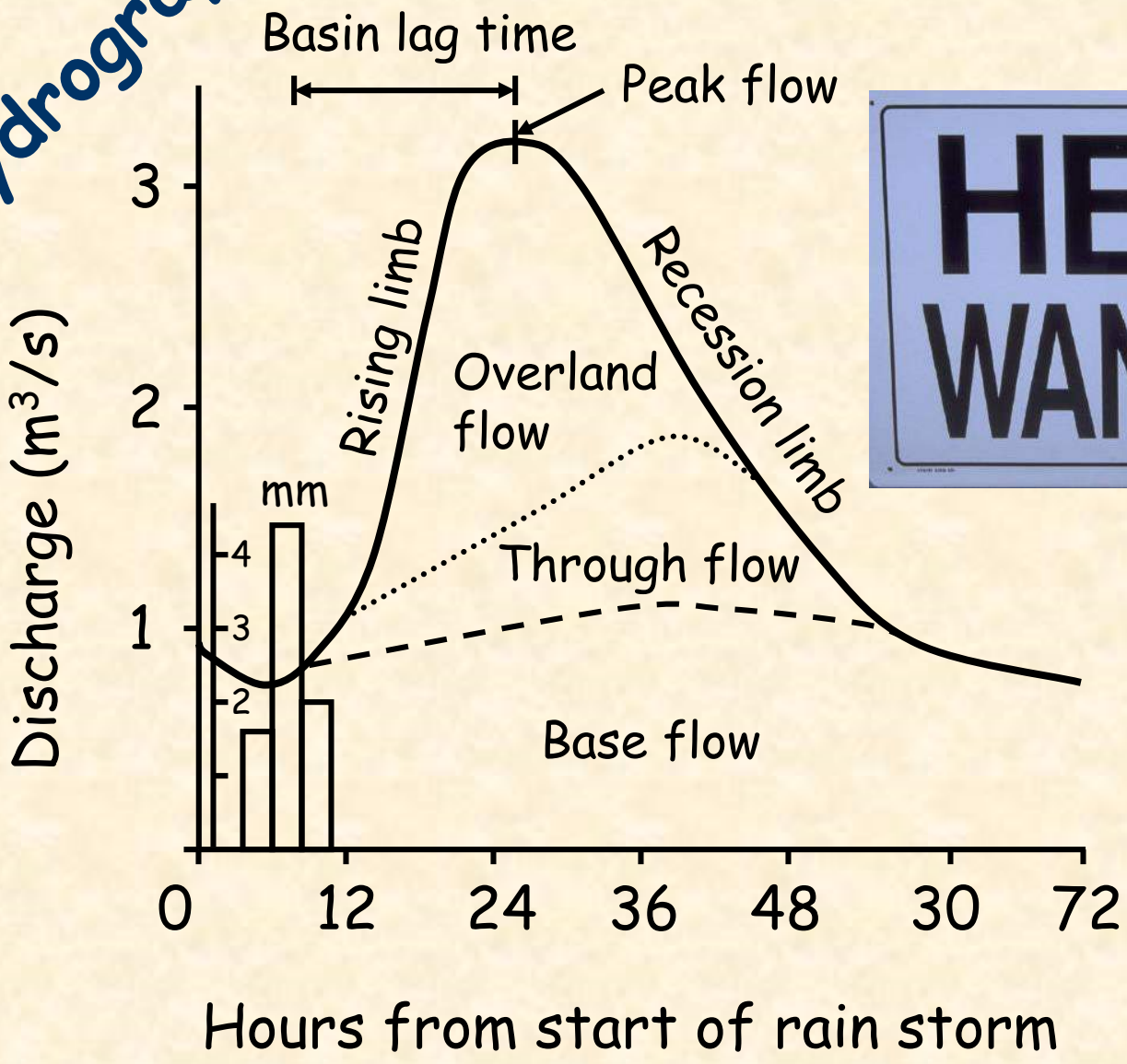
Why Construct & Analyse Hydrographs ?

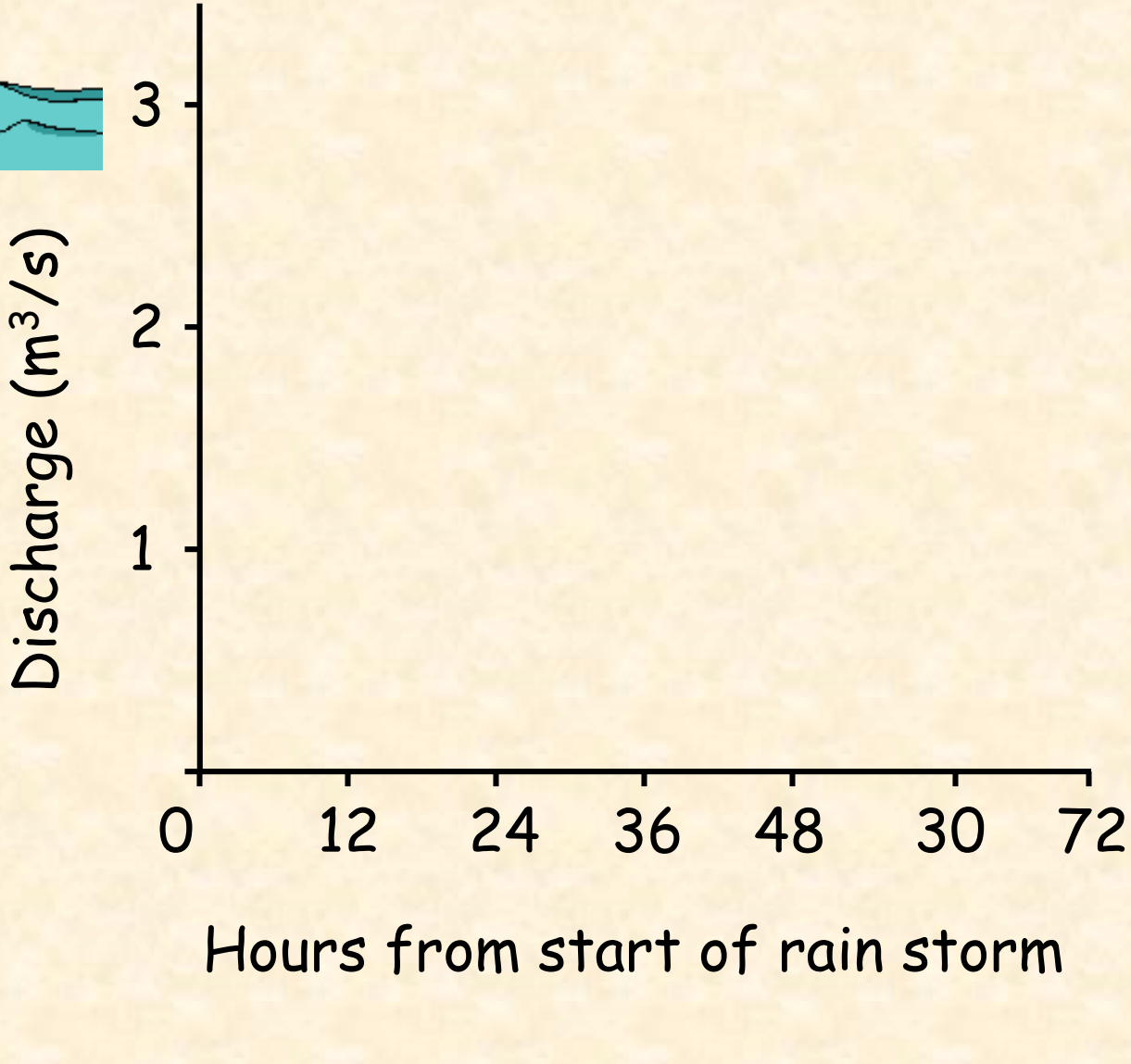
- To find out discharge patterns of a particular drainage basin
- Help predict flooding events, therefore influence implementation of flood prevention measures

Construction

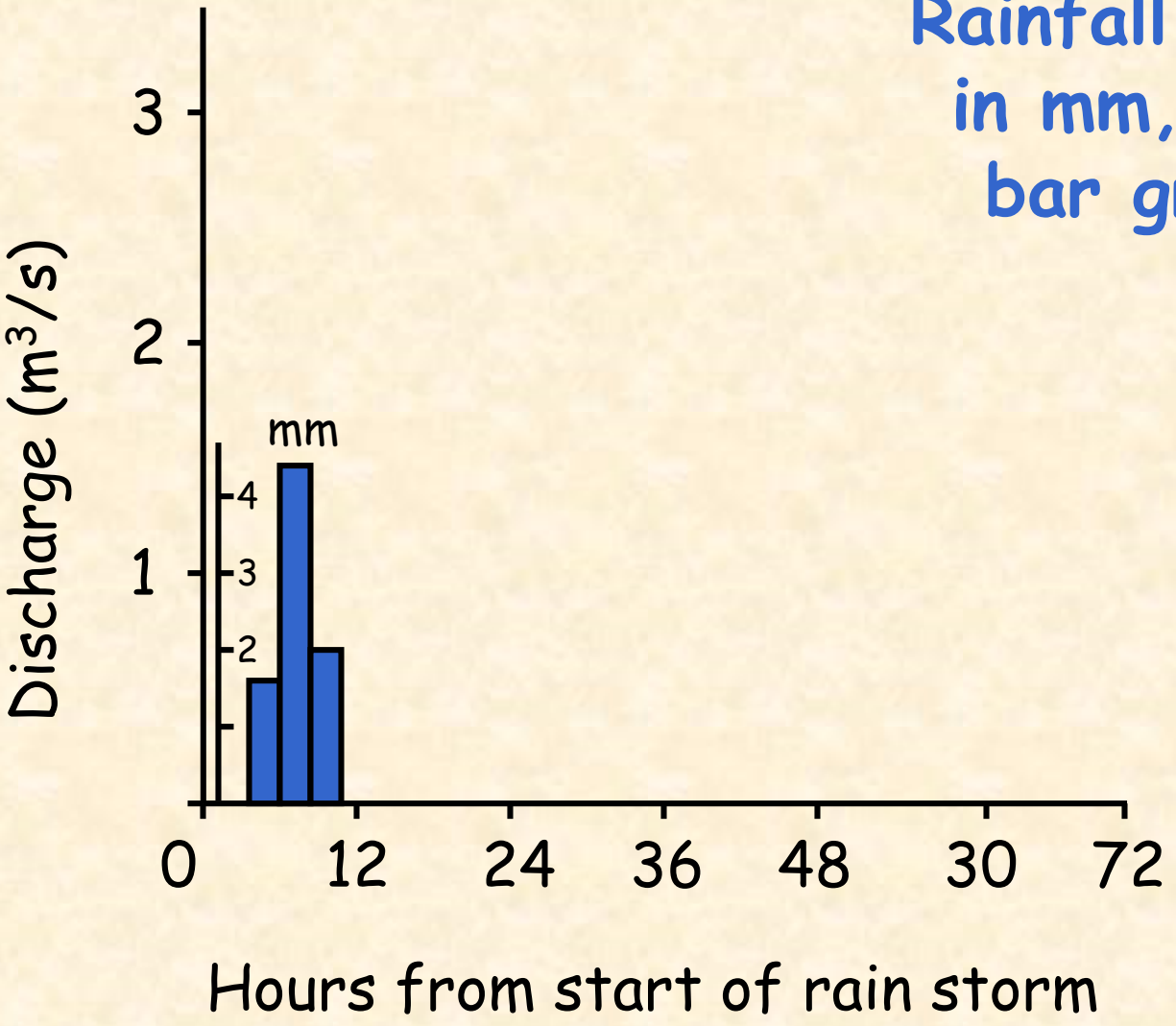
Of
Storm (flood)
Hydrographs

Flood Hydrograph

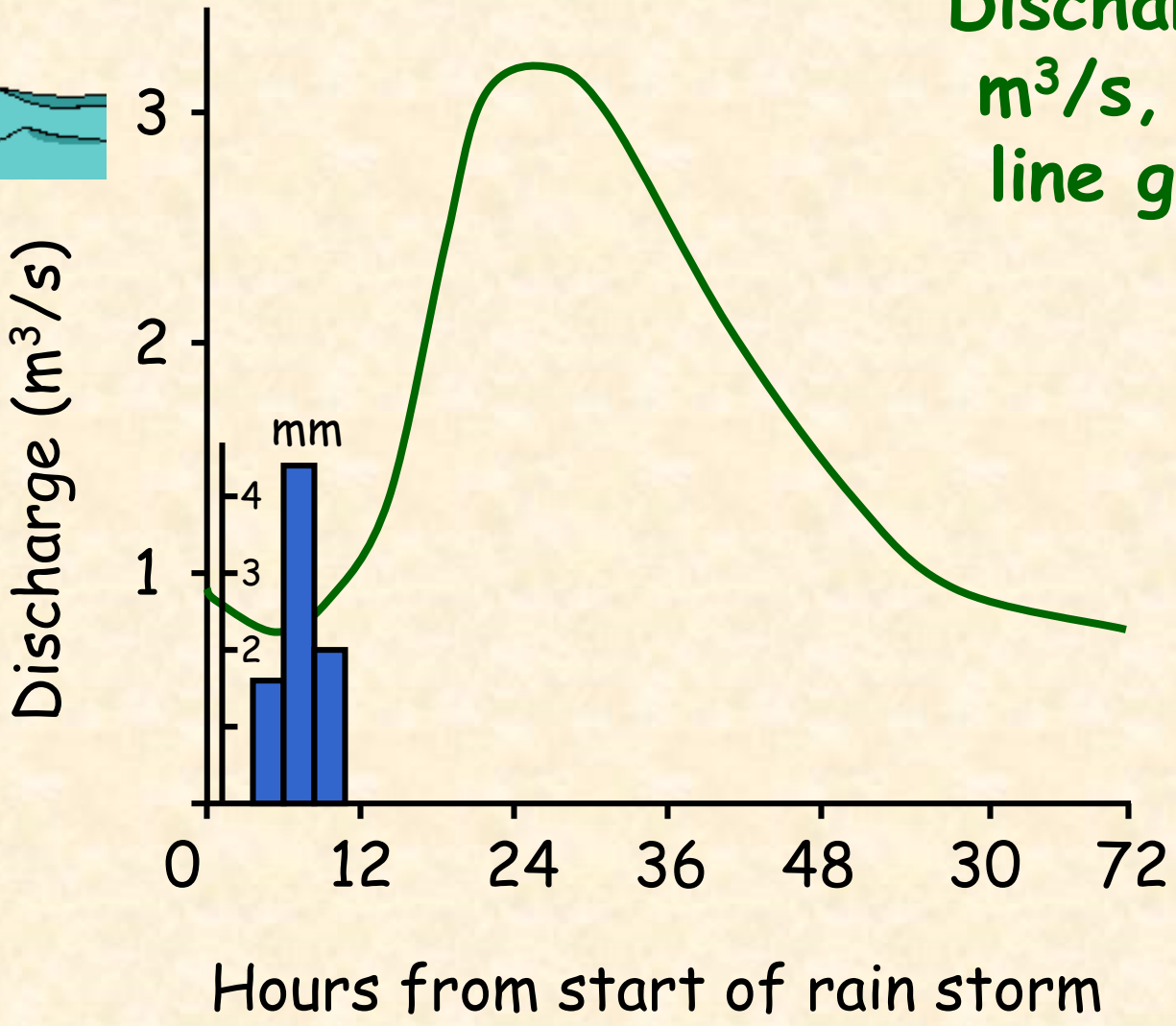



Discharge (m³/s)
3
2
1
0
12
24
36
48
30
72
Hours from start of rain storm

Rainfall shown in mm, as a bar graph

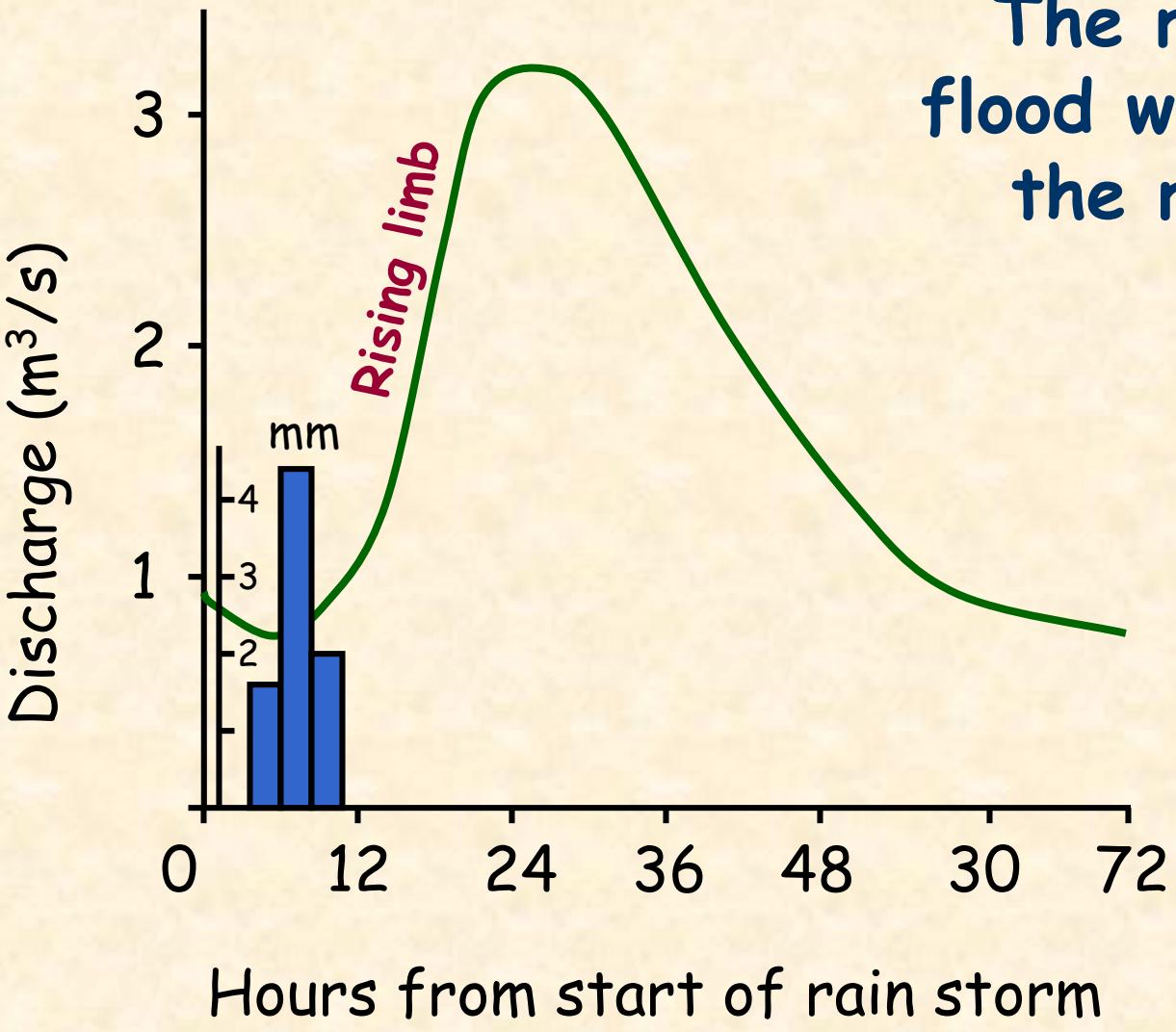


Discharge in m^3/s, as a line graph



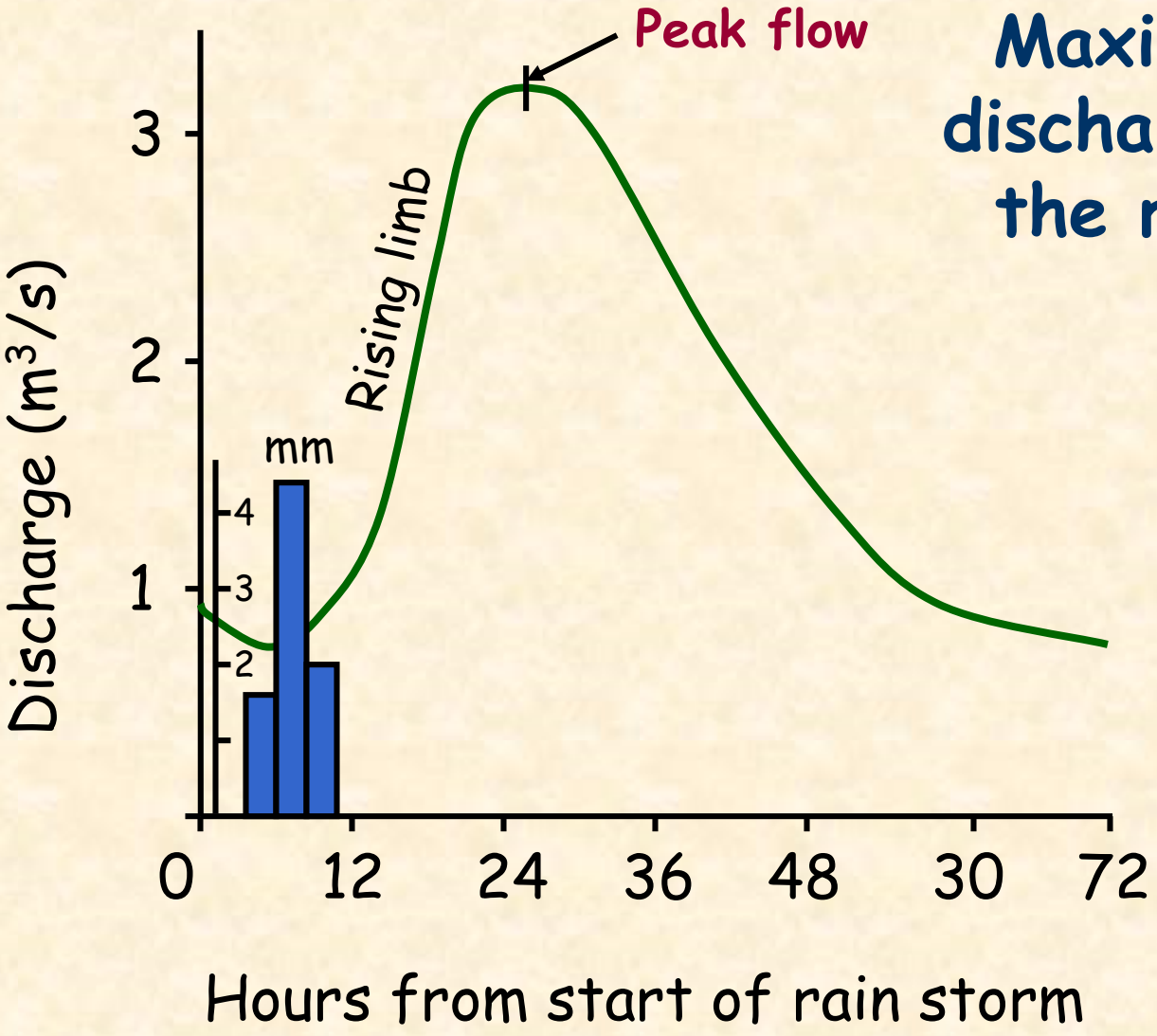
Rising limb

The rising flood water in the river



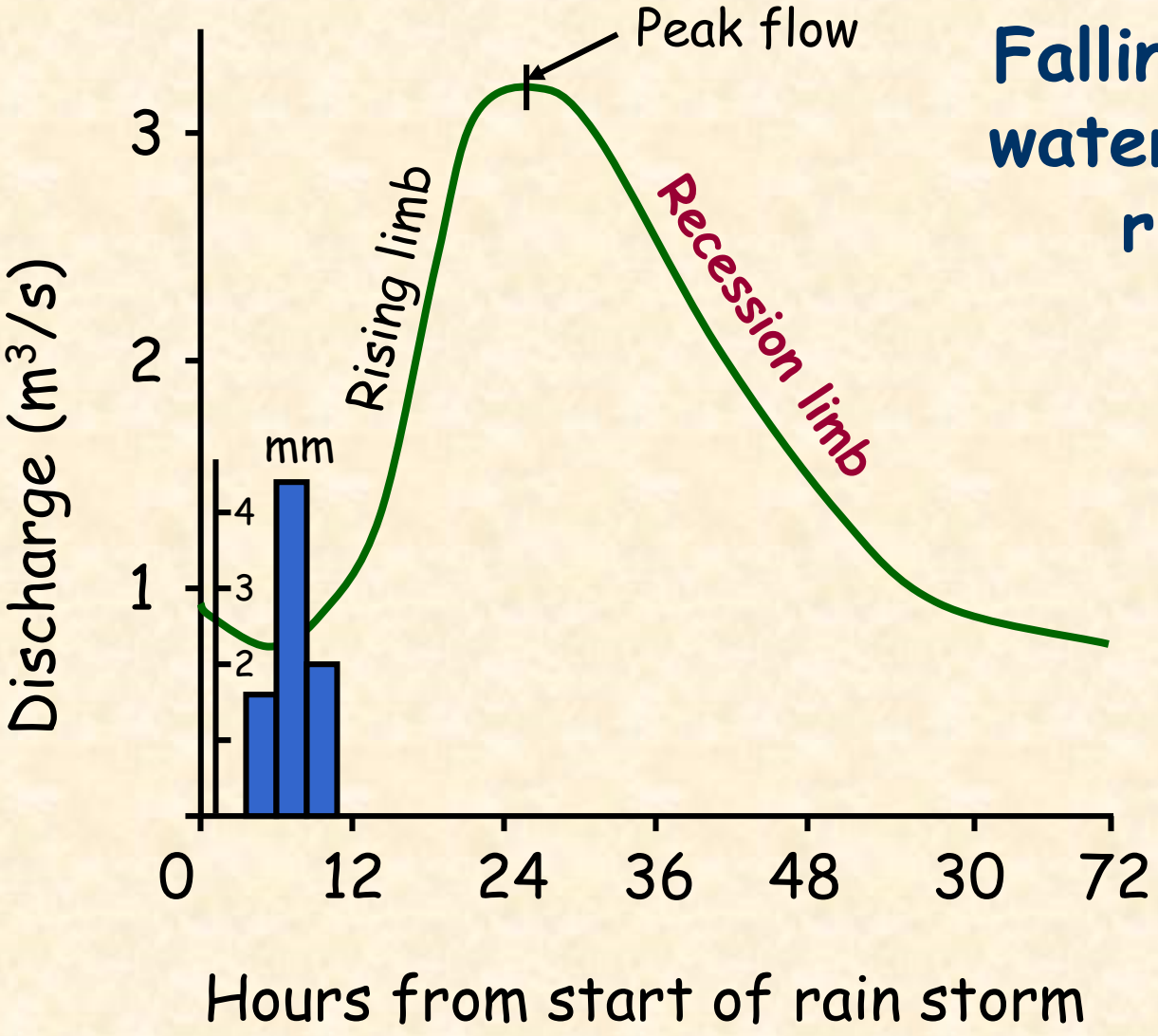
Peak flow

Maximum discharge in the river

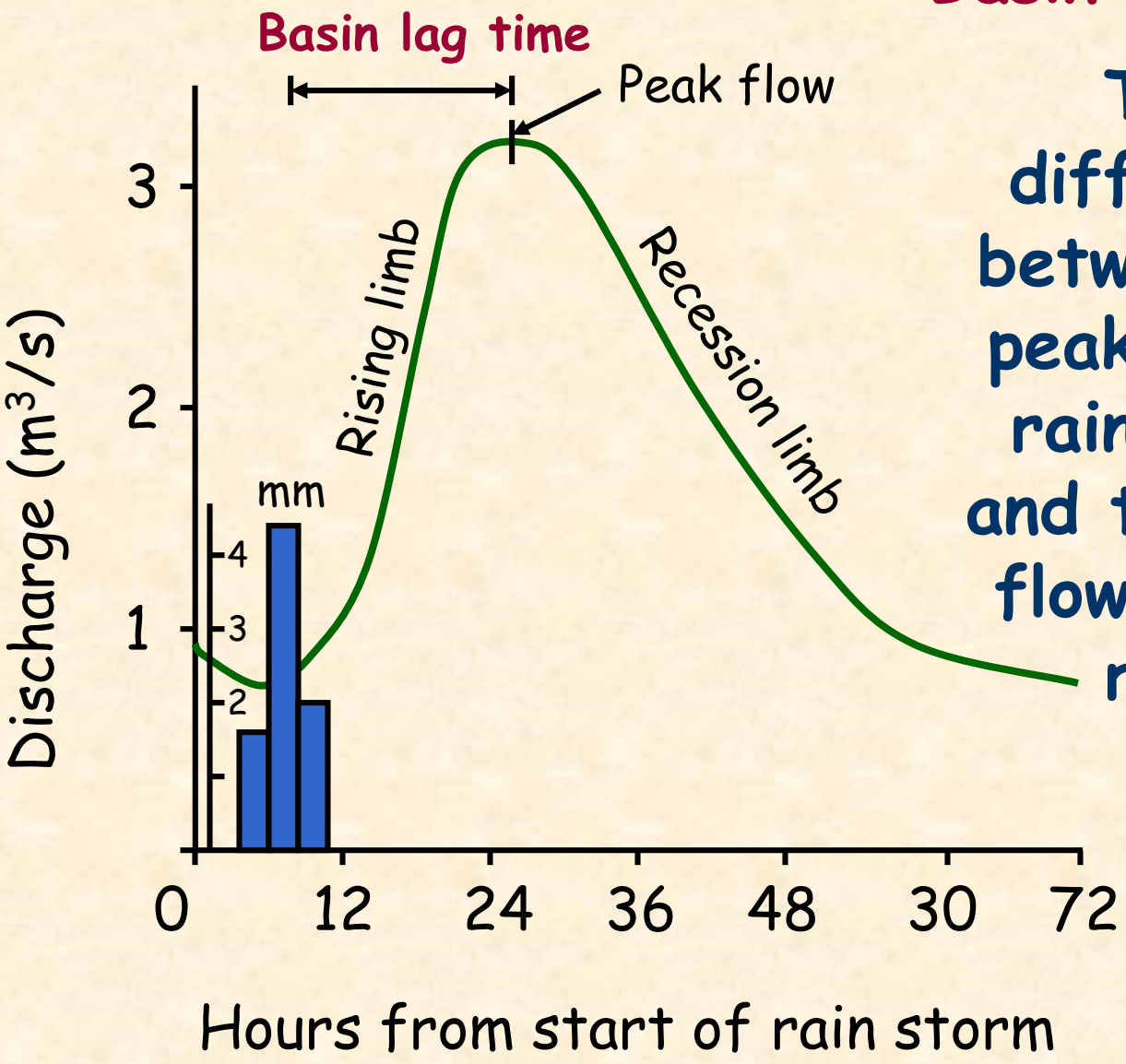


Recession limb

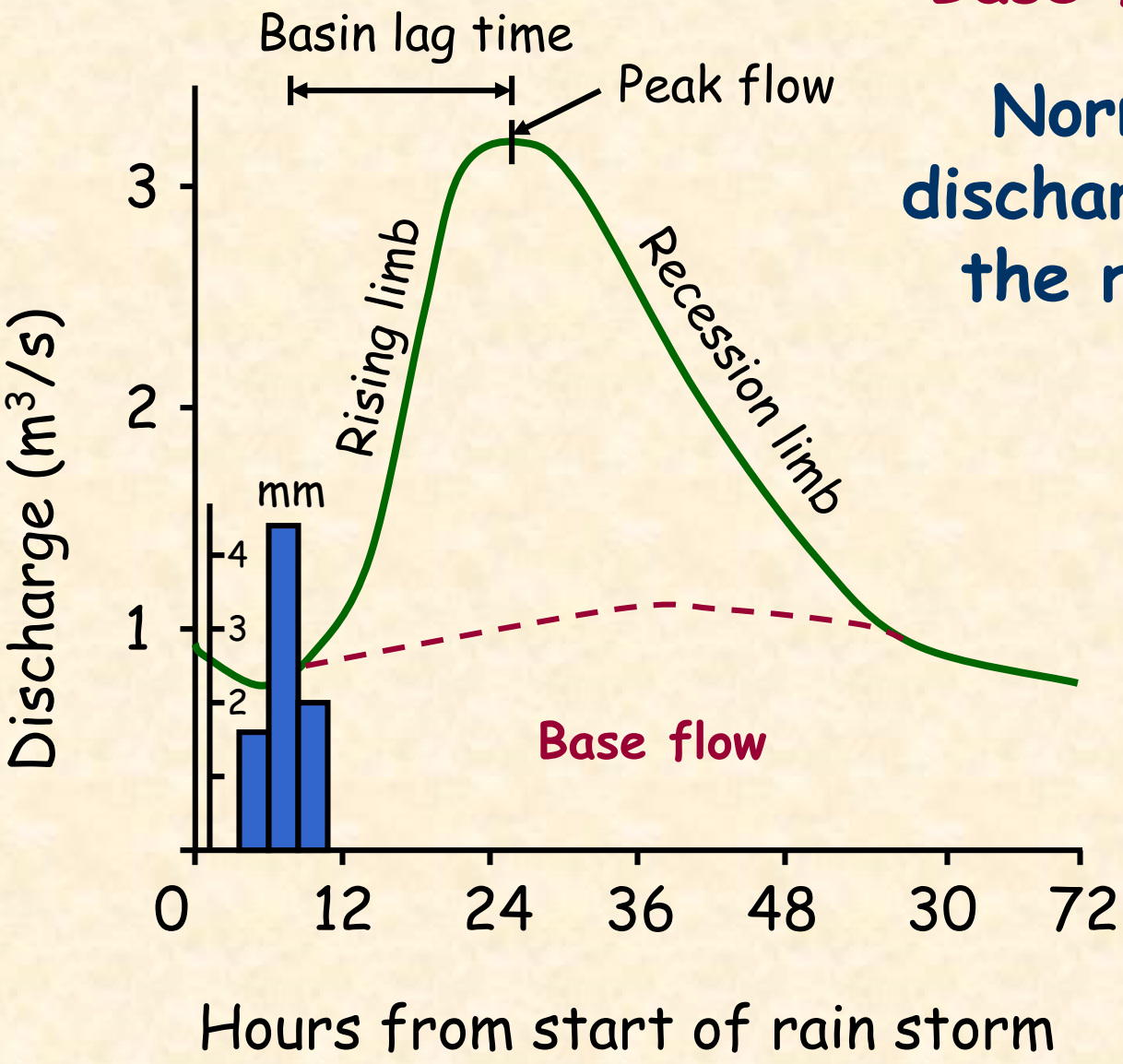
Falling flood water in the river

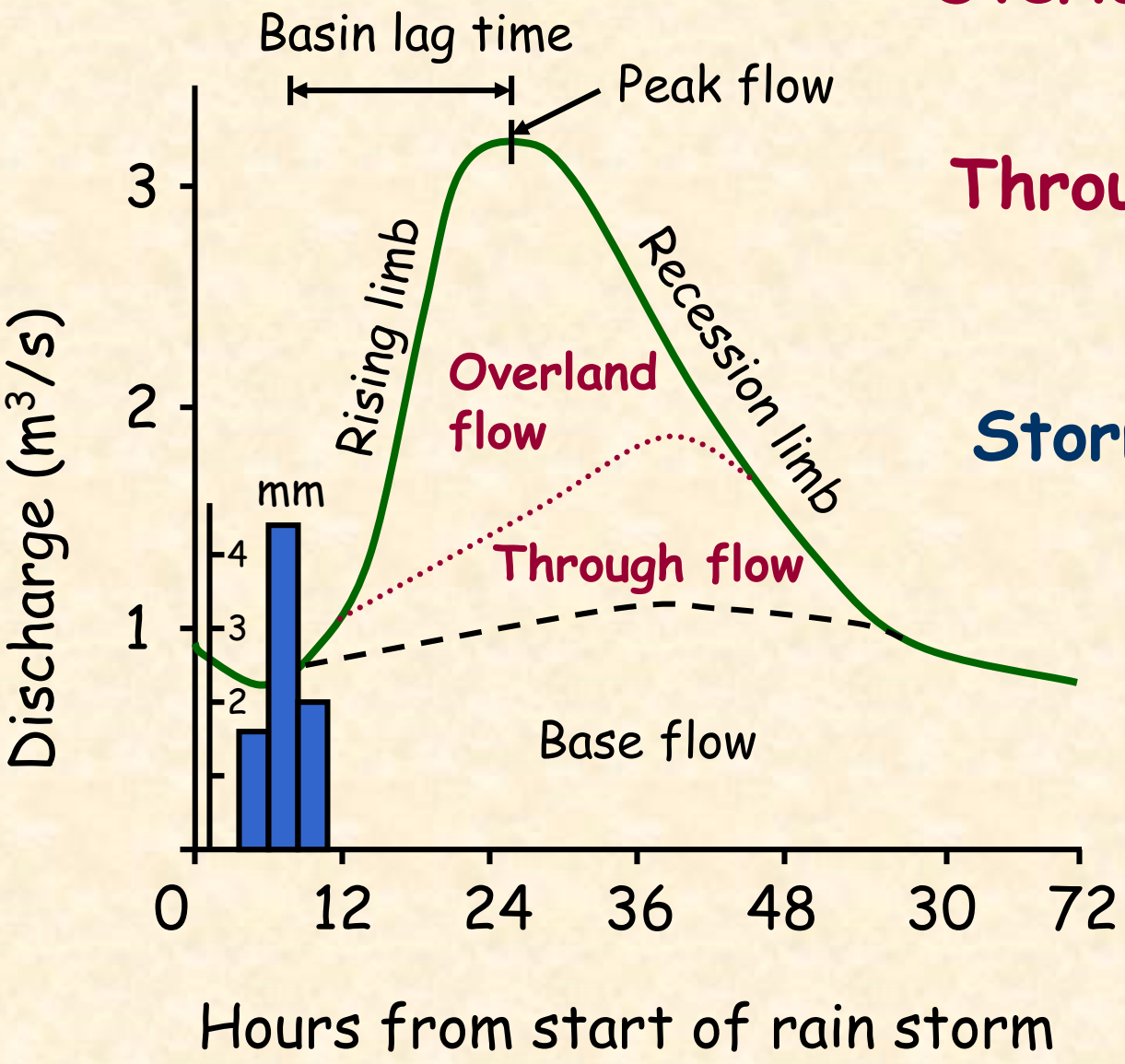


Basin lag time



Time difference between the peak of the rain storm and the peak flow of the river


Base flow
Normal discharge of the river
Basin lag time
Peak flow
Rising limb
Recession limb
mm
4
3
2
Base flow
Discharge (m³/s)
3
2
1
0
12
24
36
48
30
72
Hours from start of rain storm



Overland flow

+

Through flow

=

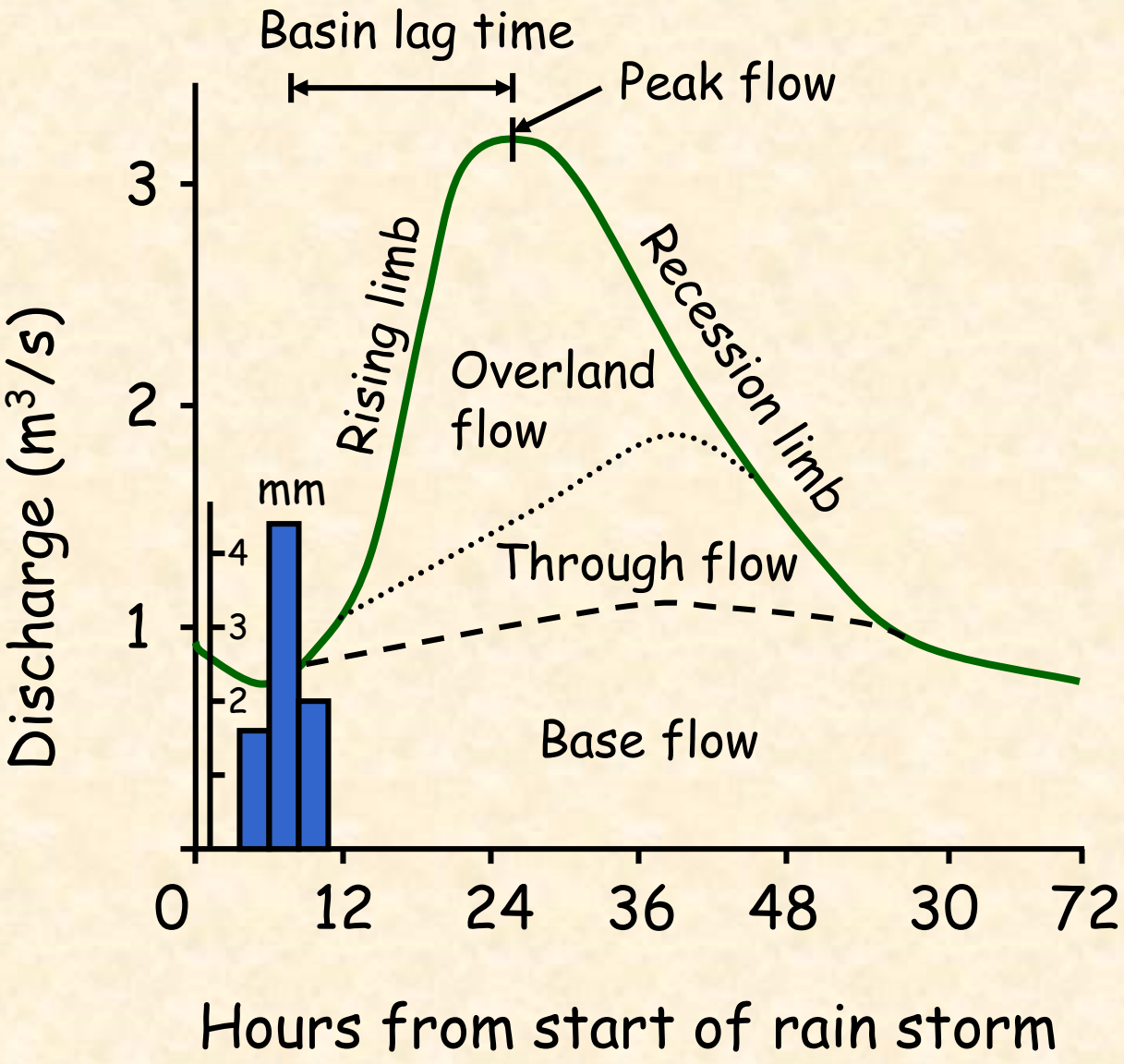
Storm Flow

Overland flow

Volume of water reaching the river from surface run off

Through flow

Volume of water reaching the river through the soil and underlying rock layers


Basin lag time
Peak flow
Rising limb
Recession limb
Overland flow
Through flow
Base flow
mm
4
3
2
Discharge (m³/s)
3
2
1
0
12
24
36
48
30
72
Hours from start of rain storm

Analysis

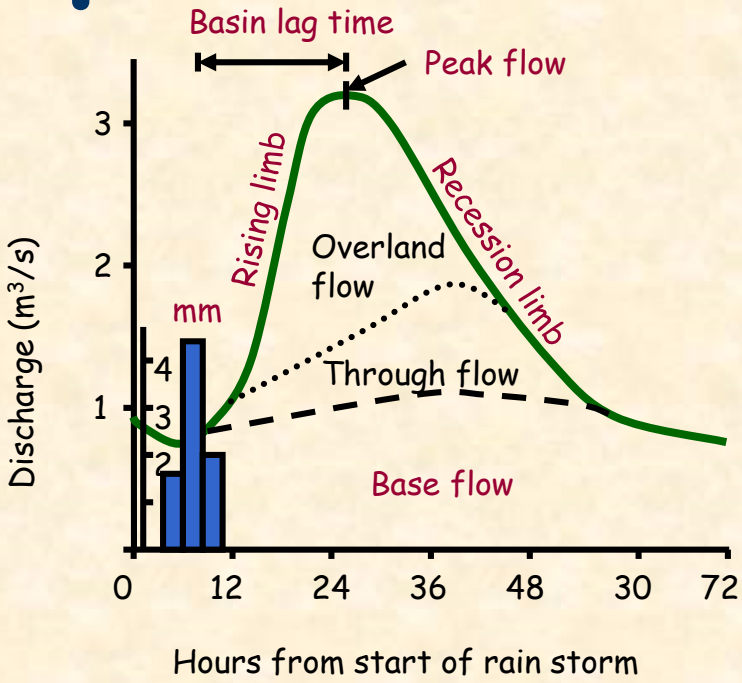
Factors influencing Storm Hydrographs

- Area
- Shape
- Slope
- Rock Type
- Soil
- Land Use
- Drainage Density
- Precipitation / Temp
- Tidal Conditions

Interpretation of Storm Hydrographs

You need to refer to:

- Rising Limb
- Recession Limb
- Lag time
- Rainfall Intensity
- Peak flow compared to Base flow
- Recovery rate, back to Base flow



Following, are some theoretical interpretations of influencing factors

BUT.....

When interpreting hydrographs all factors must be considered together !

Area

- Large basins receive more precipitation than small therefore have larger runoff

- Larger size means longer lag time as water has a longer distance to travel to reach the trunk river

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Shape

- Elongated basin will produce a lower peak flow and longer lag time than a circular one of the same size

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Slope

- Channel flow can be faster down a steep slope therefore steeper rising limb and shorter lag time

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Rock Type

- Permeable rocks mean rapid infiltration and little overland flow therefore shallow rising limb

Area	**Rock Type**	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Soil

- Infiltration is generally greater on thick soil, although less porous soils eg. clay act as impermeable layers

- The more infiltration occurs the longer the lag time and shallower the rising limb

Area	Rock Type	Drainage Density
Shape	**Soil**	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Land Use

- Urbanisation - concrete and tarmac form impermeable surfaces, creating a steep rising limb and shortening the time lag

- Afforestation - intercepts the precipitation, creating a shallow rising limb and lengthening the time lag

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Drainage Density

- A higher density will allow rapid overland flow

Area	Rock Type	**Drainage Density**
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Precipitation & Temperature

- Short intense rainstorms can produce rapid overland flow and steep rising limb
- If there have been extreme temperatures, the ground can be hard (either baked or frozen) causing rapid surface run off
- Snow on the ground can act as a store producing a long lag time and shallow rising limb. Once a thaw sets in the rising limb will become steep

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Tidal Conditions

- High spring tides can block the normal exit for the water, therefore extending the length of time the river basin takes to return to base flow

Area	Rock Type	Drainage Density
Shape	Soil	Precipitation / Temp
Slope	Land Use	Tidal Conditions

Remember these influencing factors will:

- Influence each other
- Change throughout the rivers course