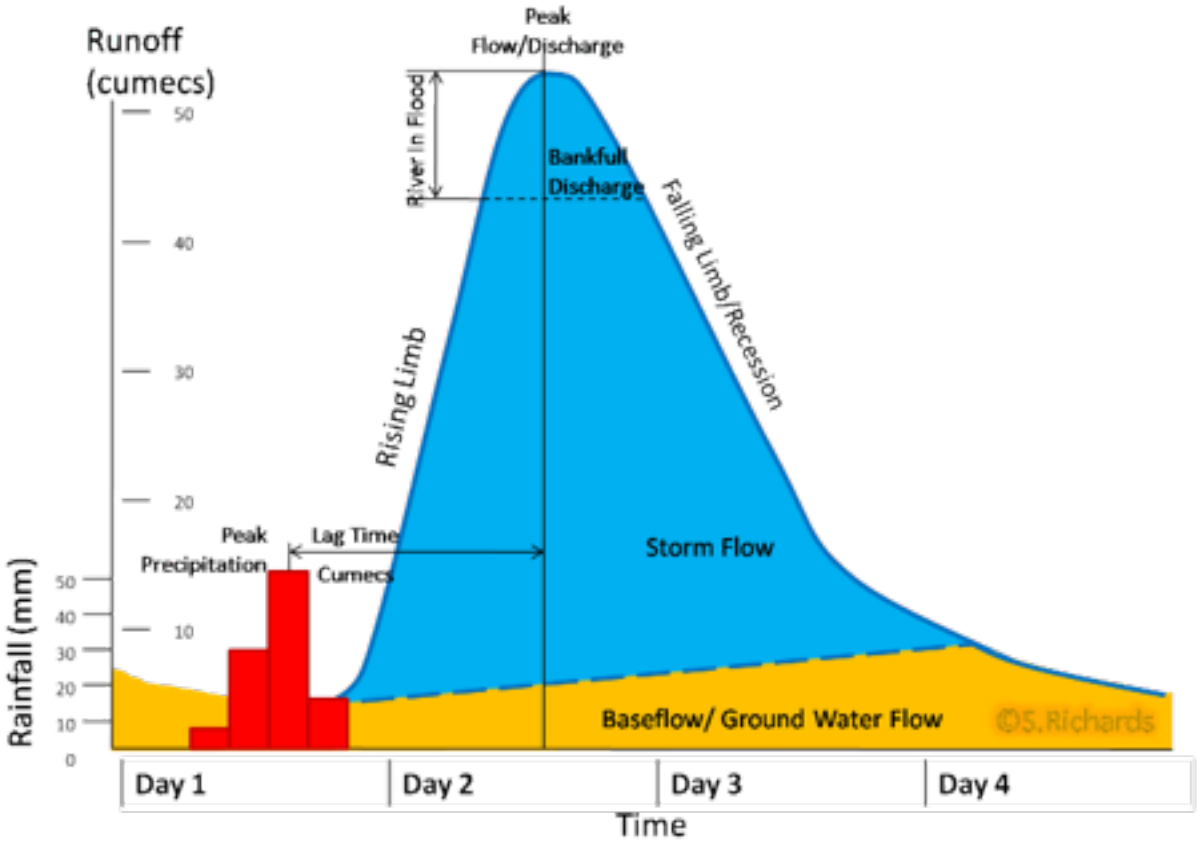
How and why do the water in a river fluctuate?

LESSON OUTCOMES

- Explain factors influencing river levels
- Construct a storm hydrograph
- Analyse a storm hydrograph

What is this? Can you explain it?



Discharge

- The volume of water passing a given point in a river is called the **discharge**
  - Measured in cumecs
- This can fluctuate a lot in a matter of hours

- Using your hydrological cycle and your own knowledge can you think of any reasons for the data shown
  - Reasons that a river's discharge may change include:

Date	Time	Discharge in cubic meters per second (cumecs)
7 Jan 2005	0000 hours	90
	1200 hours	130
8 Jan 2005	0000 hours	820
	1200 hours	1,400
	1500 hours	1,520
9 Jan 2005	0000 hours	1,000
	1200 hours	430

Factors affecting discharge

- River discharge is influenced by a number of factors related to the weather, other physical factors and human land use

- For each of the following explain how it could change the level of discharge

Amount of rainfall

Intensity of rainfall

Level of saturation

Rock Type

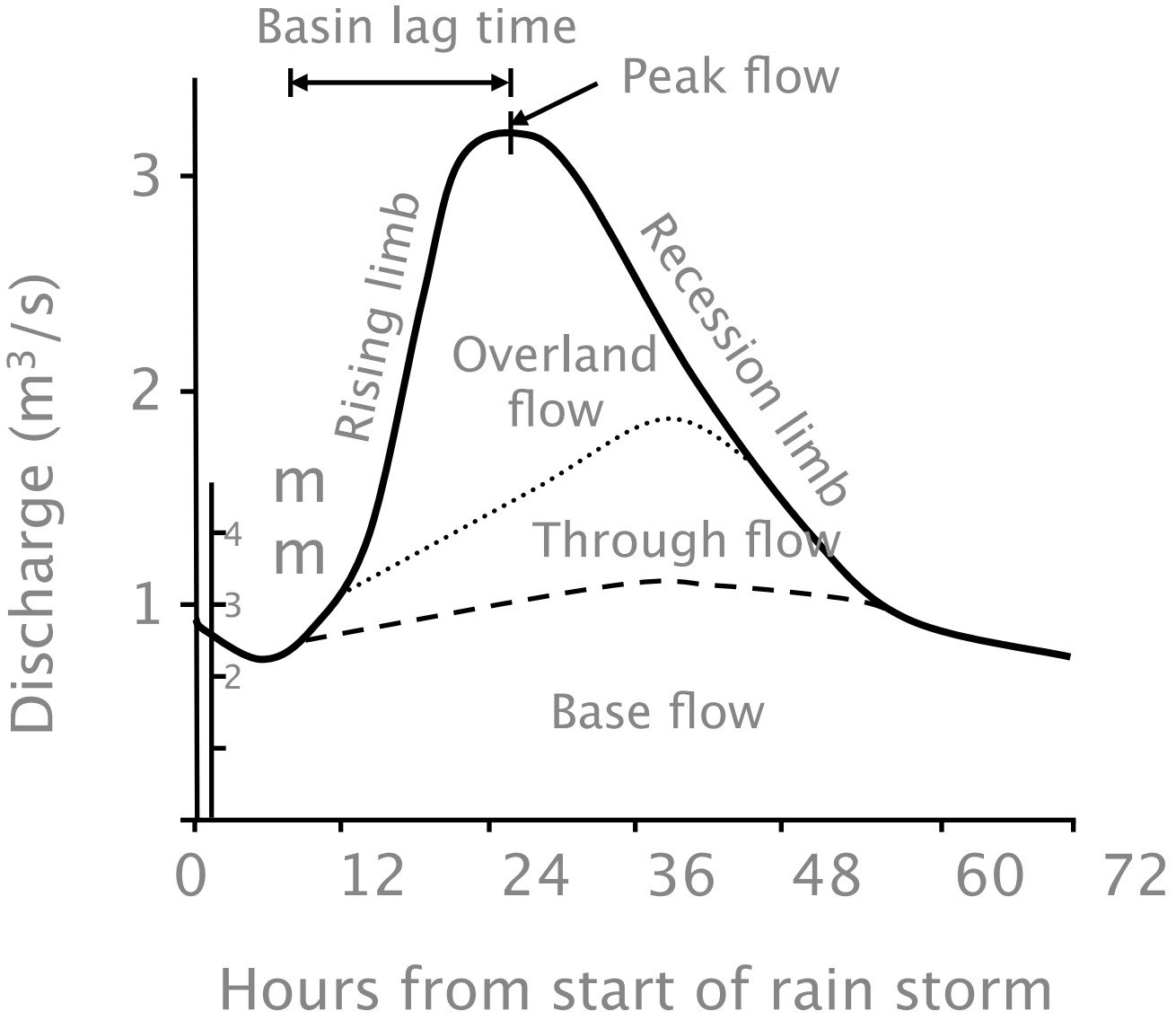
Relief

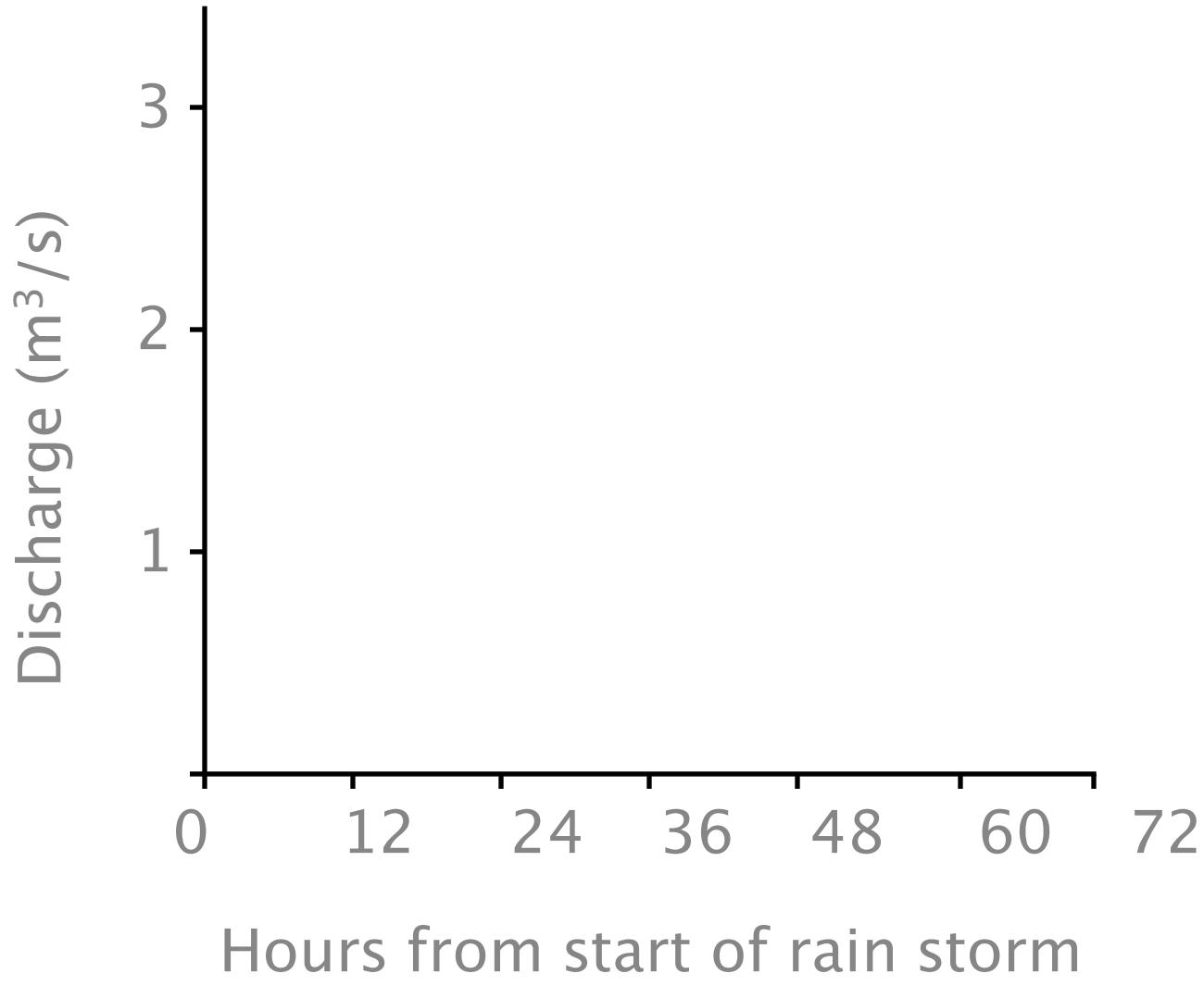
Temperature

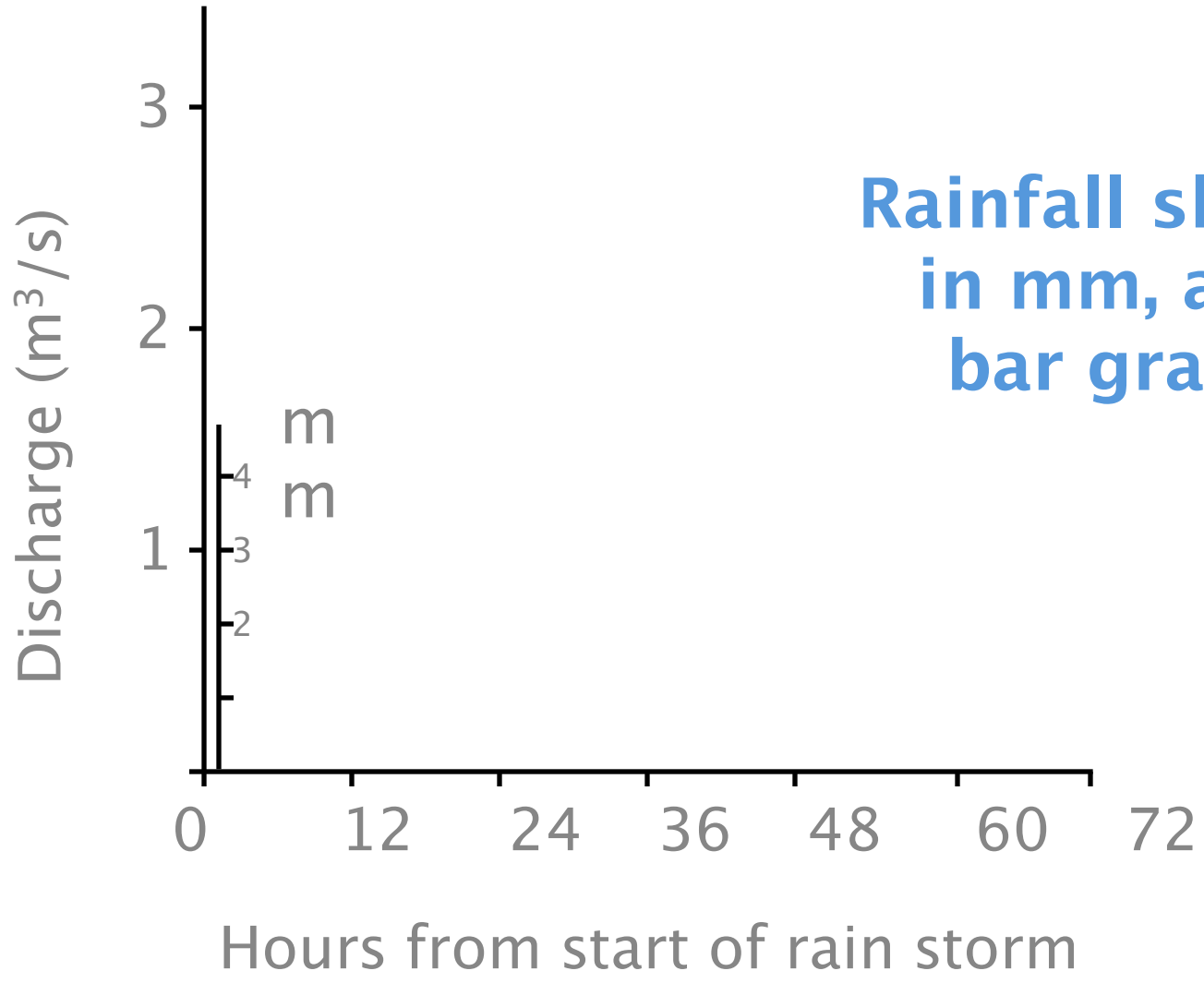
Land use

Ground cover

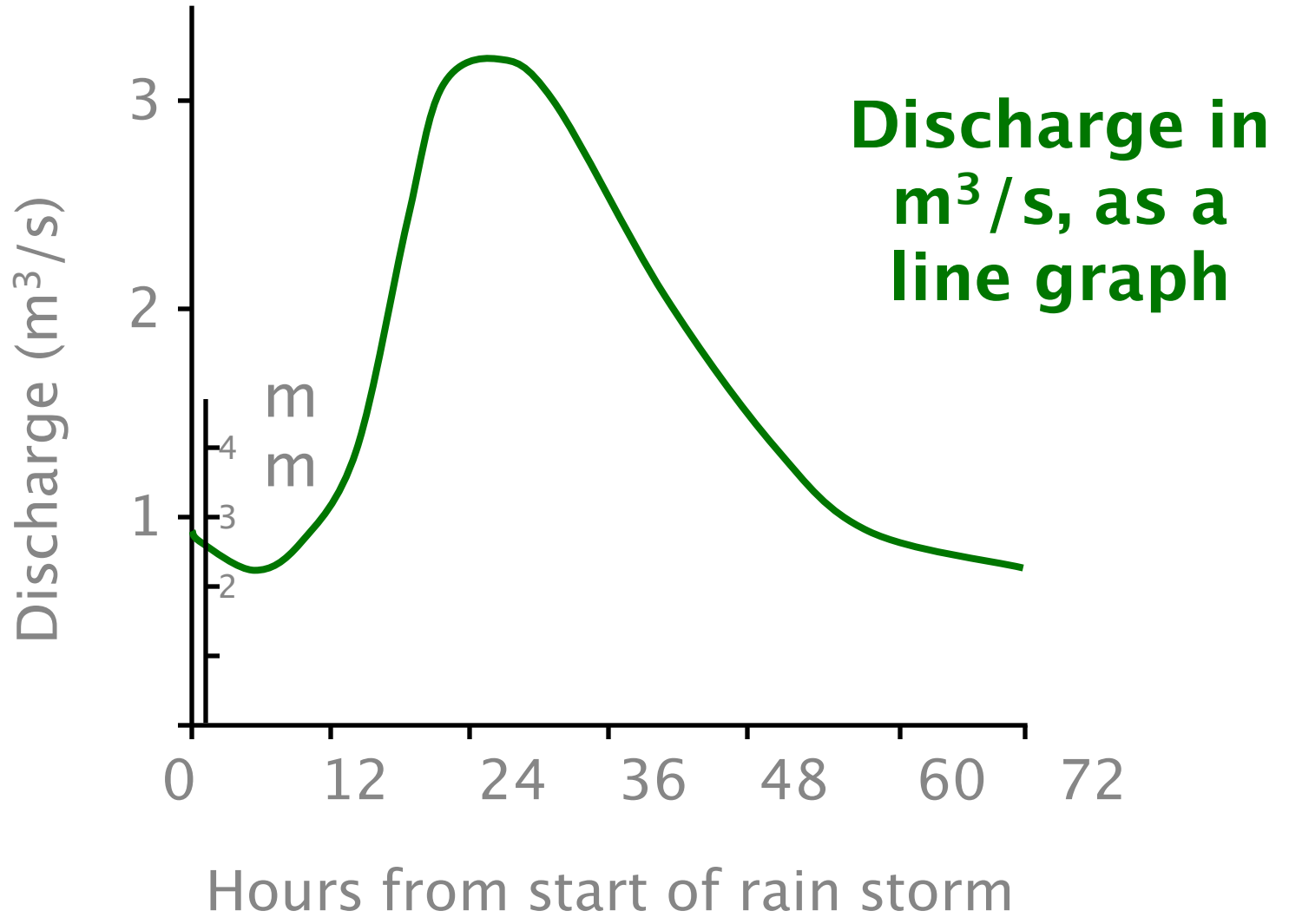
Storm (flood) Hydrograph



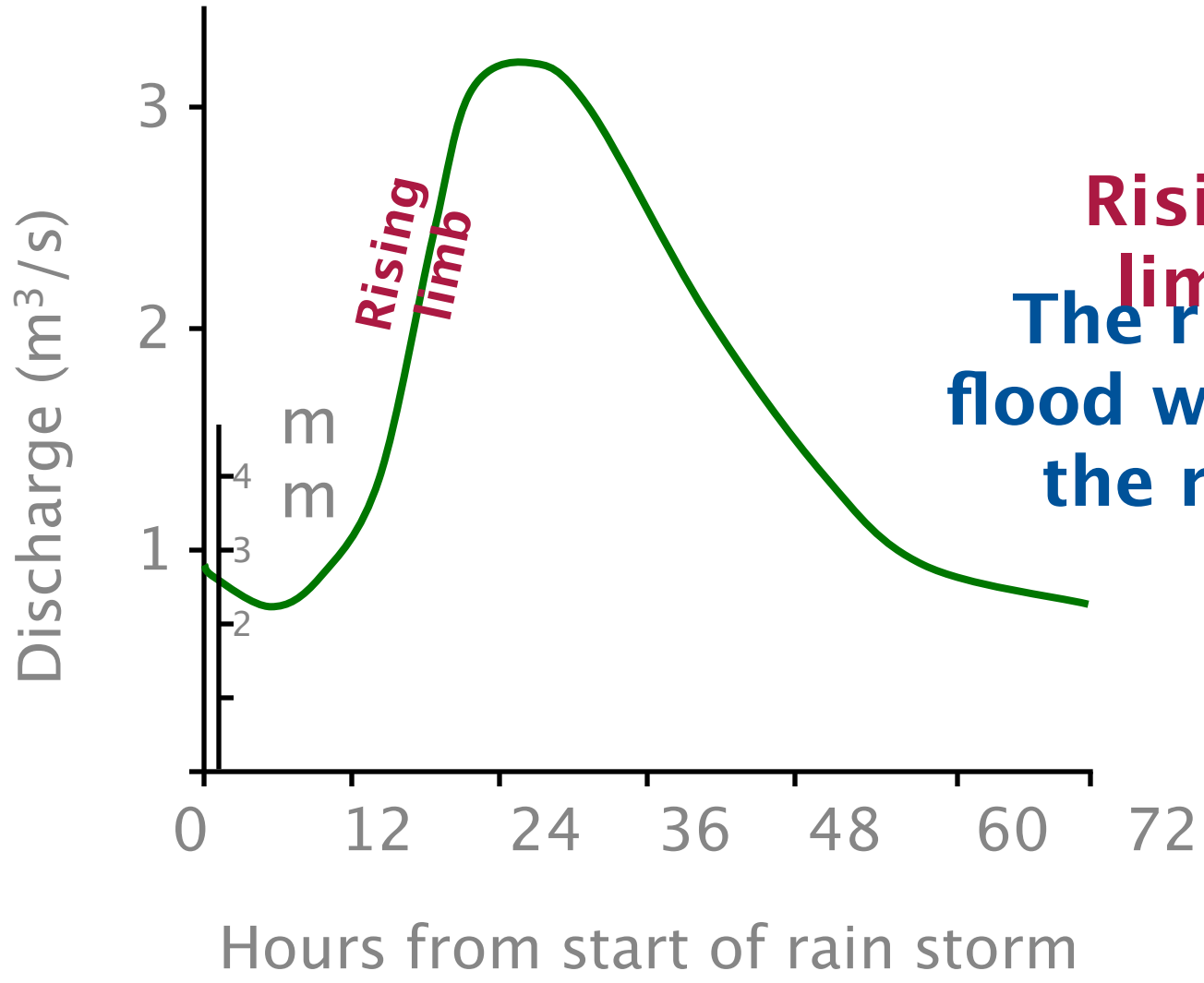

Discharge (m^3/s)
3
2
1
0
12
24
36
48
60
72
Hours from start of rain storm



Rainfall shown in mm, as a bar graph

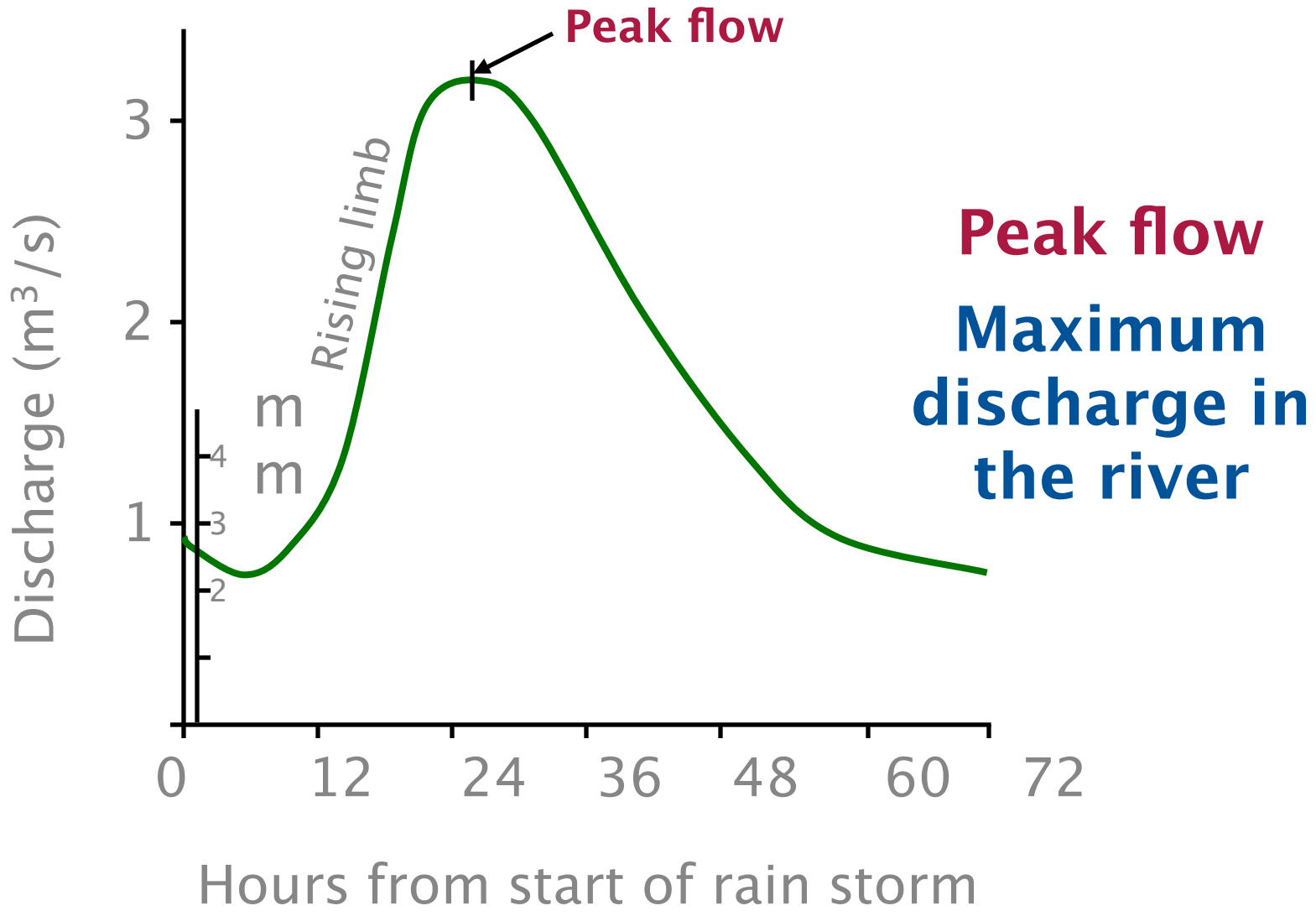


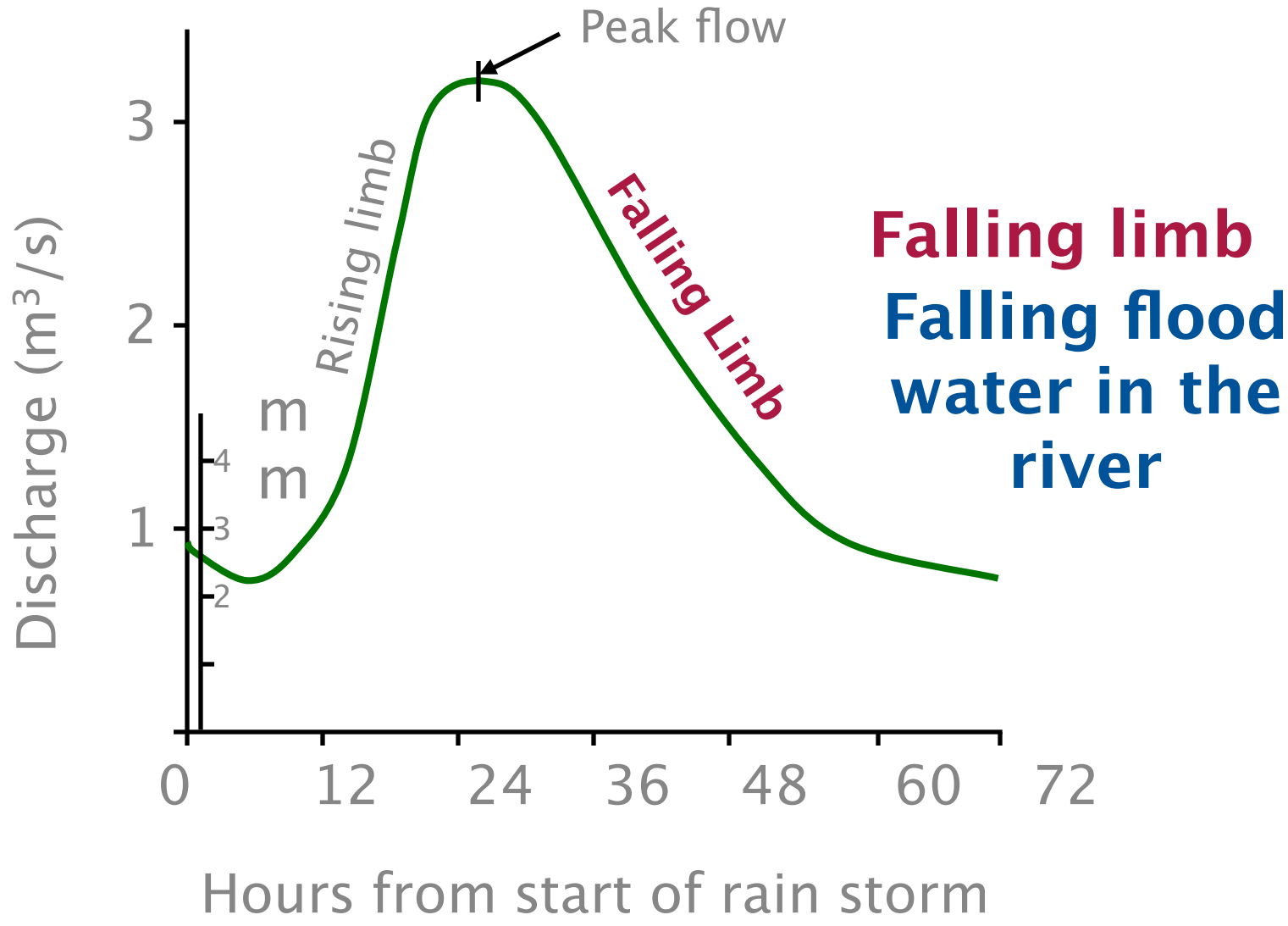
Discharge in m^3/s, as a line graph



Rising limb

The rising flood water in the river

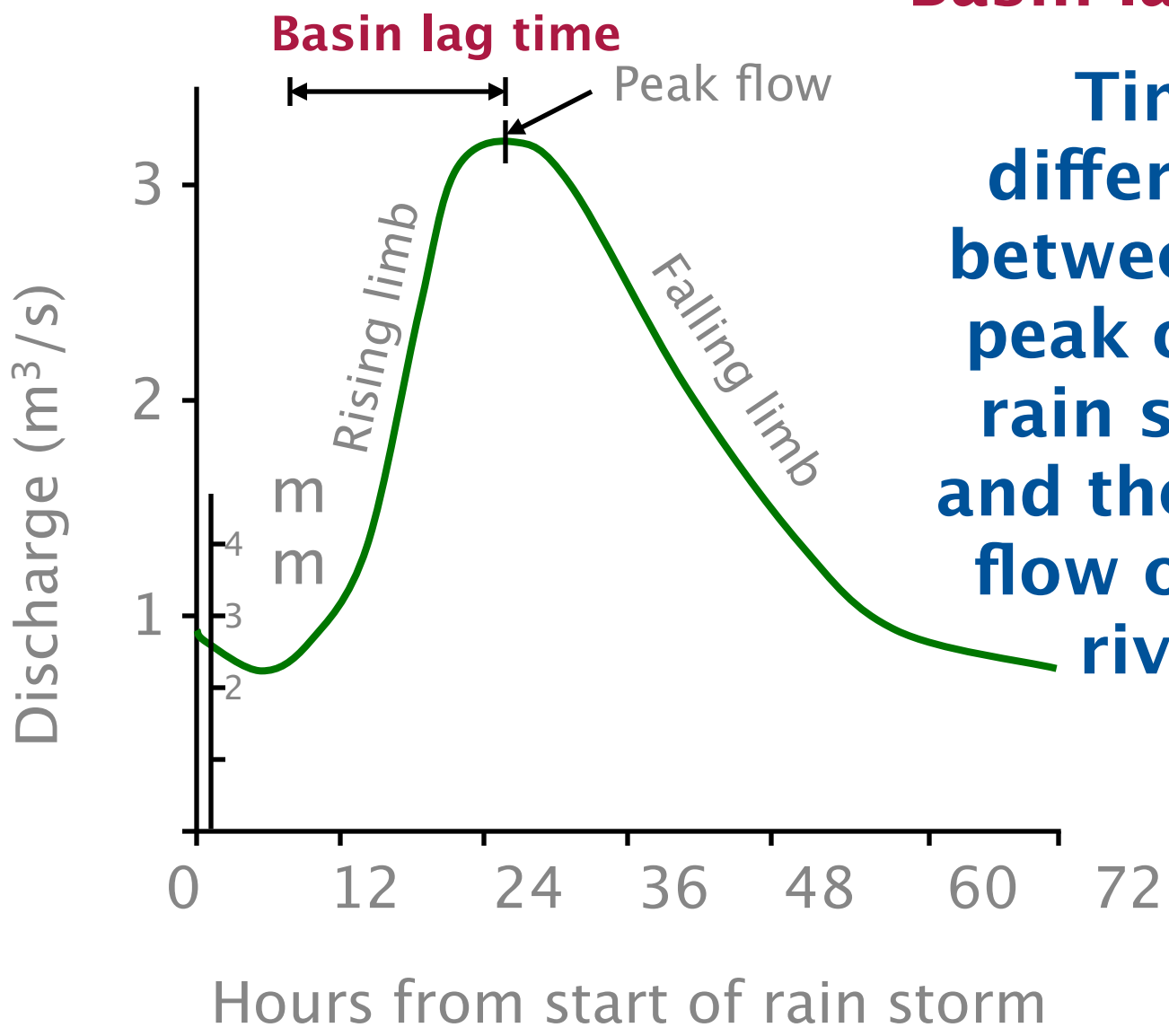

Peak flow
Rising limb
Discharge (m³/s)
3
2
1
m
m
4
3
2
0
12
24
36
48
60
72
Hours from start of rain storm
Peak flow
Maximum discharge in the river



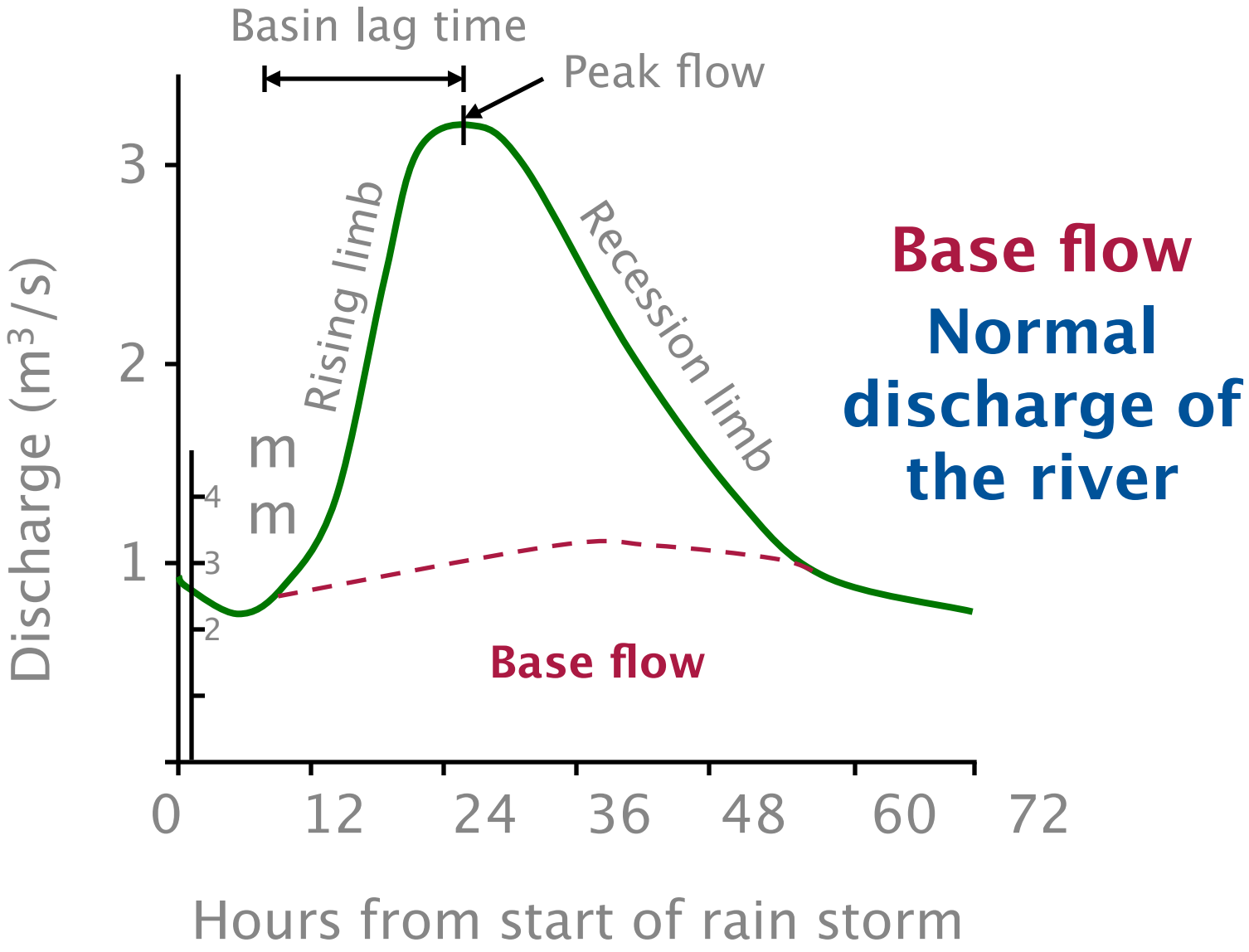
Falling limb

Falling flood water in the river

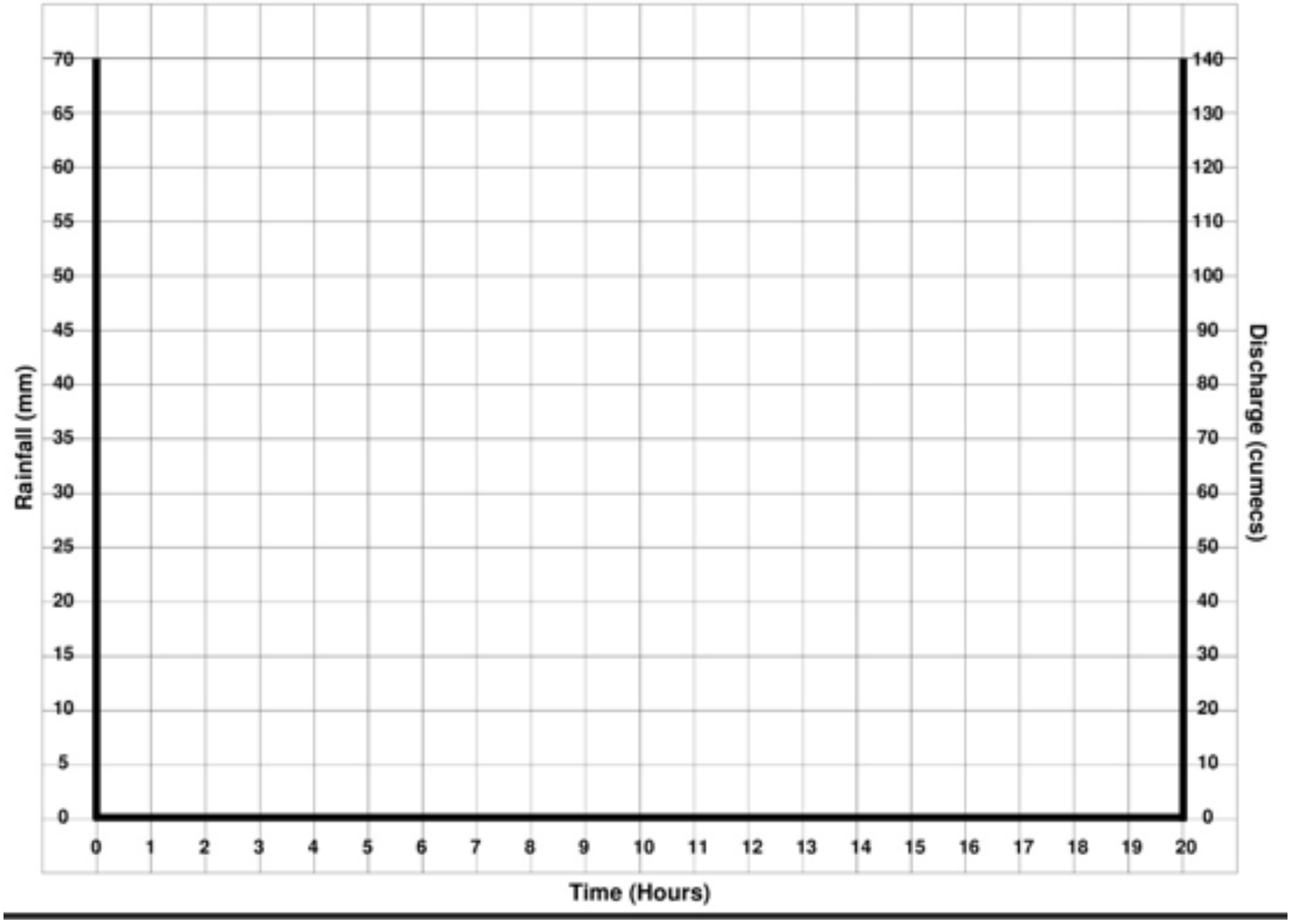
Basin lag time



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


Basin lag time
Peak flow
Rising limb
Recession limb
Base flow
Discharge (m³/s)
Hours from start of rain storm
0
12
24
36
48
60
72
1
2
3
m
m
4
3
2
Base flow
Normal discharge of the river

Flood Hydrographs



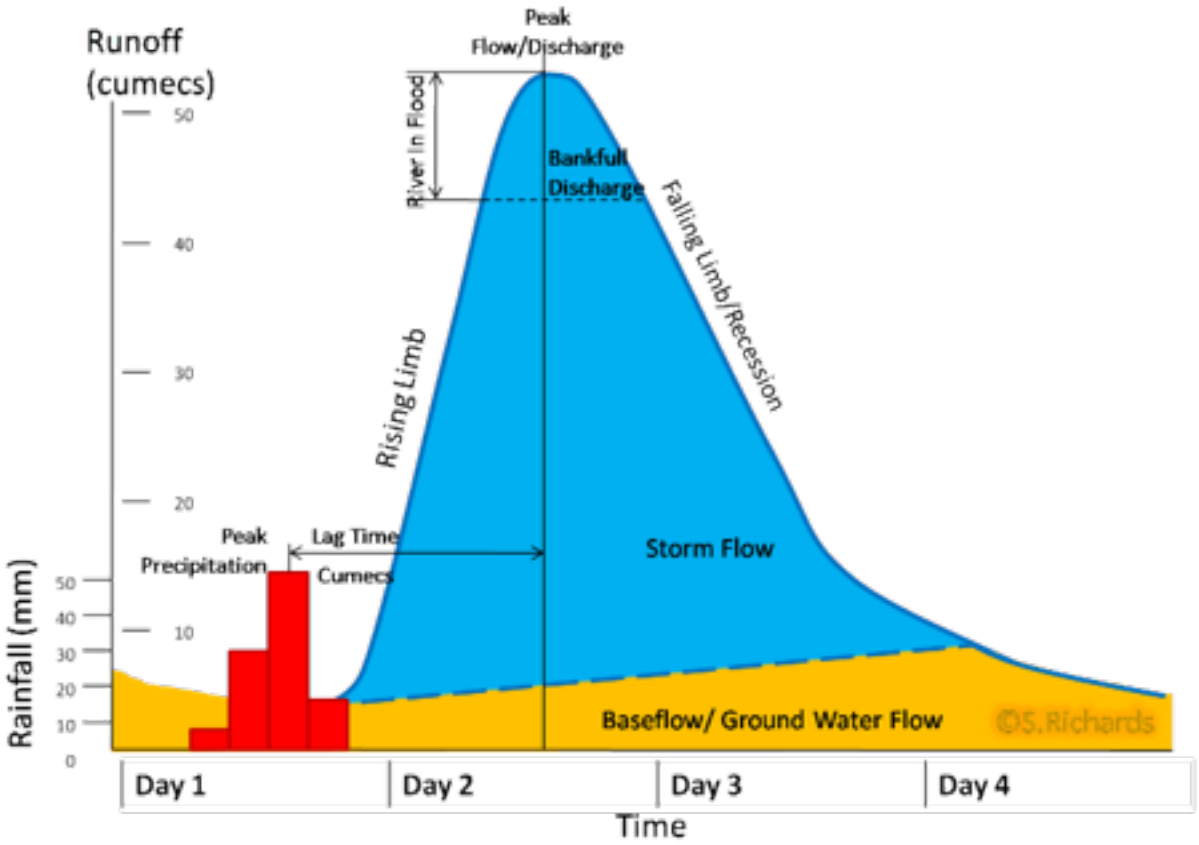
Hours	1st	2nd	3rd	4th	5th	6th
Rainfall (mm)	10	30	40	25	15	5

Time (hours)	0	2	4	6	8	10	12	14	16	18	20
Discharge (cumecs)	30	35	45	80	130	100	70	50	40	35	30

Worksheets

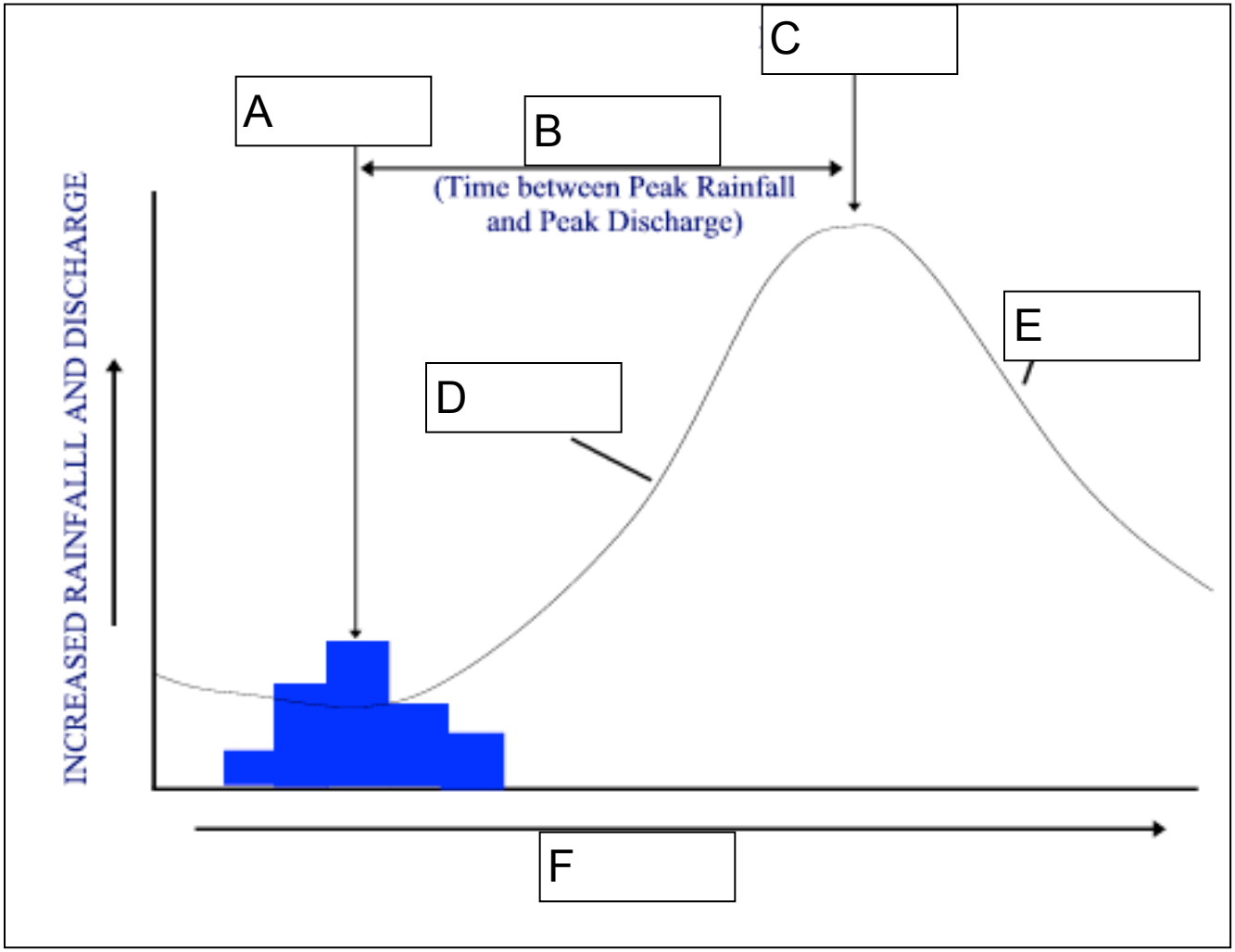
- Now you have been through the formation of a flood hydrograph, use your new knowledge to fill in your sheets
- If you get stuck, use the text book for help
  - Before asking for help see if anyone on your table can help you out
- You have fifteen minutes

What is this? Can you explain it?

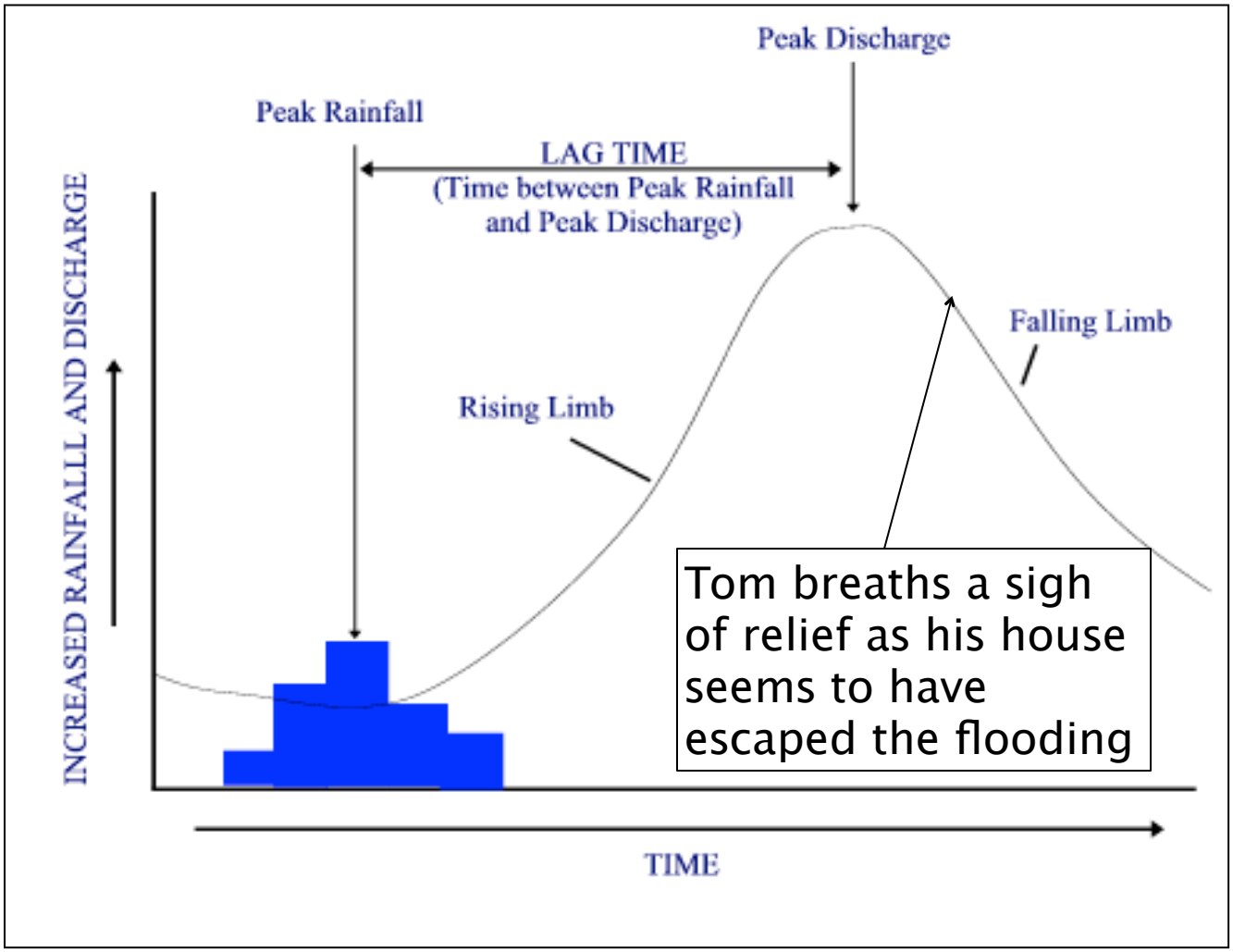


- With a partner discuss the two questions above
- Are you more comfortable answering these questions than you were at the beginning?

Label your hydrograph with the : peak rainfall, time, discharge, rising limb, falling limb, lag time



How would this apply to real life?



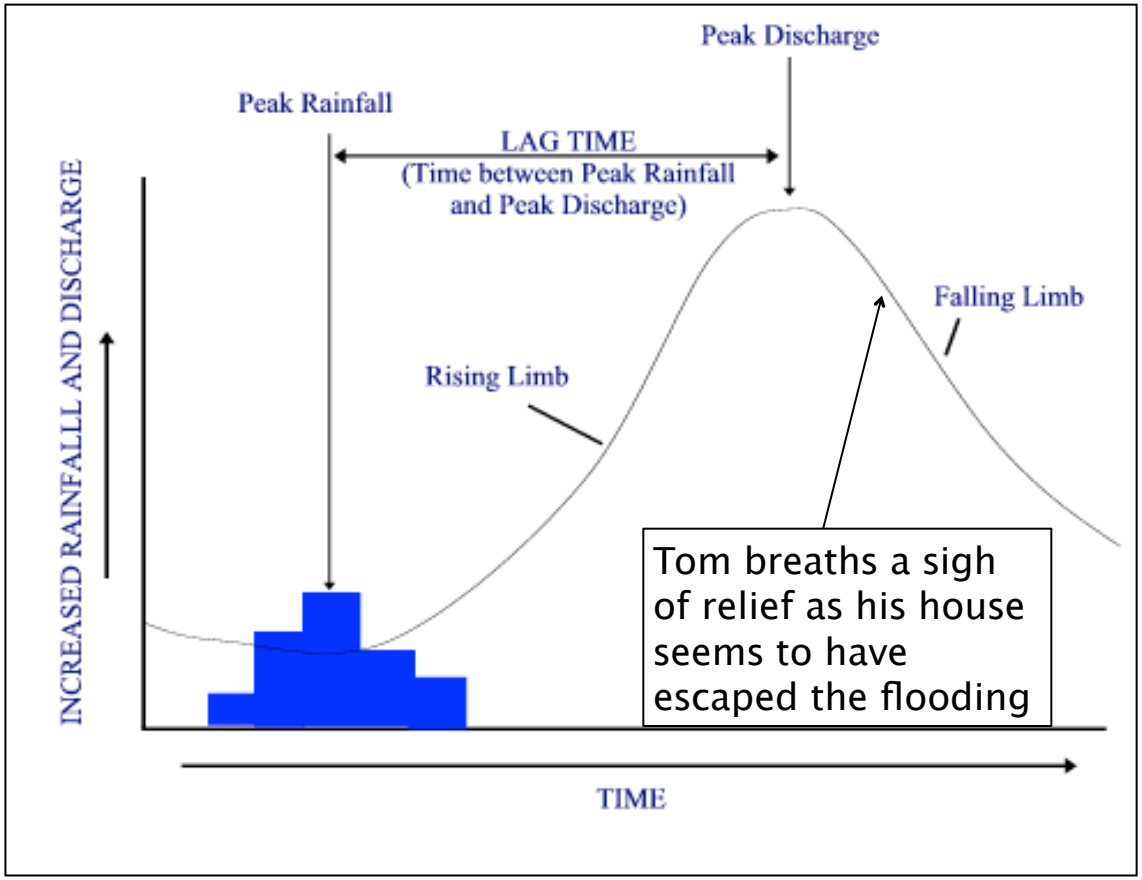
Now add the following statements to your hydrograph

1. Rob places sandbags by the door as he thinks the river might flood.

2. Sarah moves the family upstairs as the river has burst its banks.

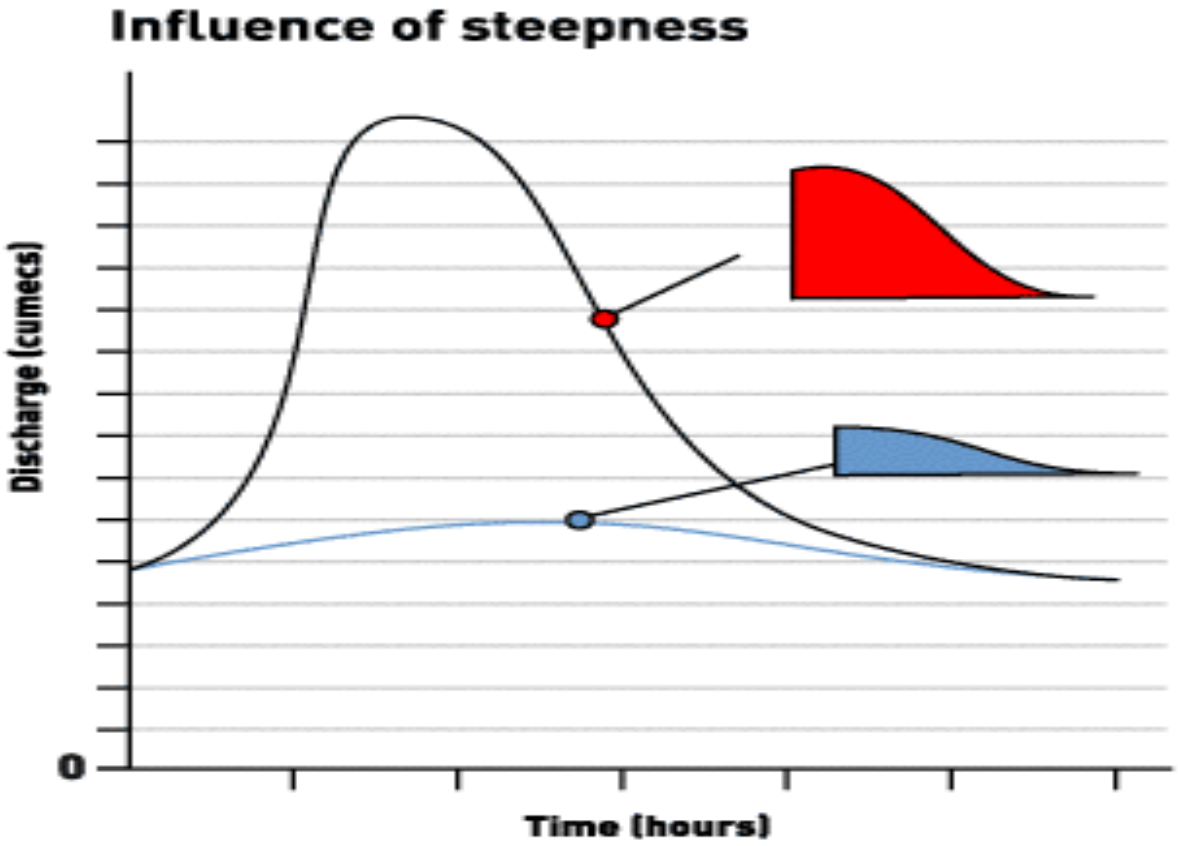
3. The Environment Agency removes the flood warning from the river.

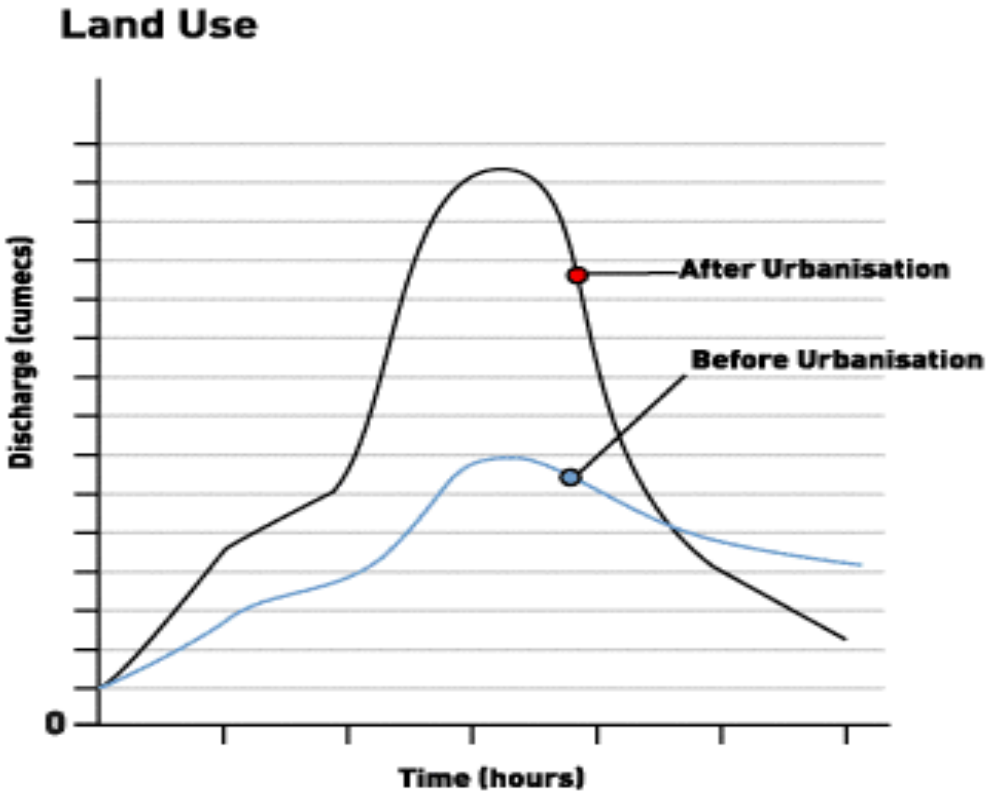
4. The referee calls off the football match after a pitch inspection.

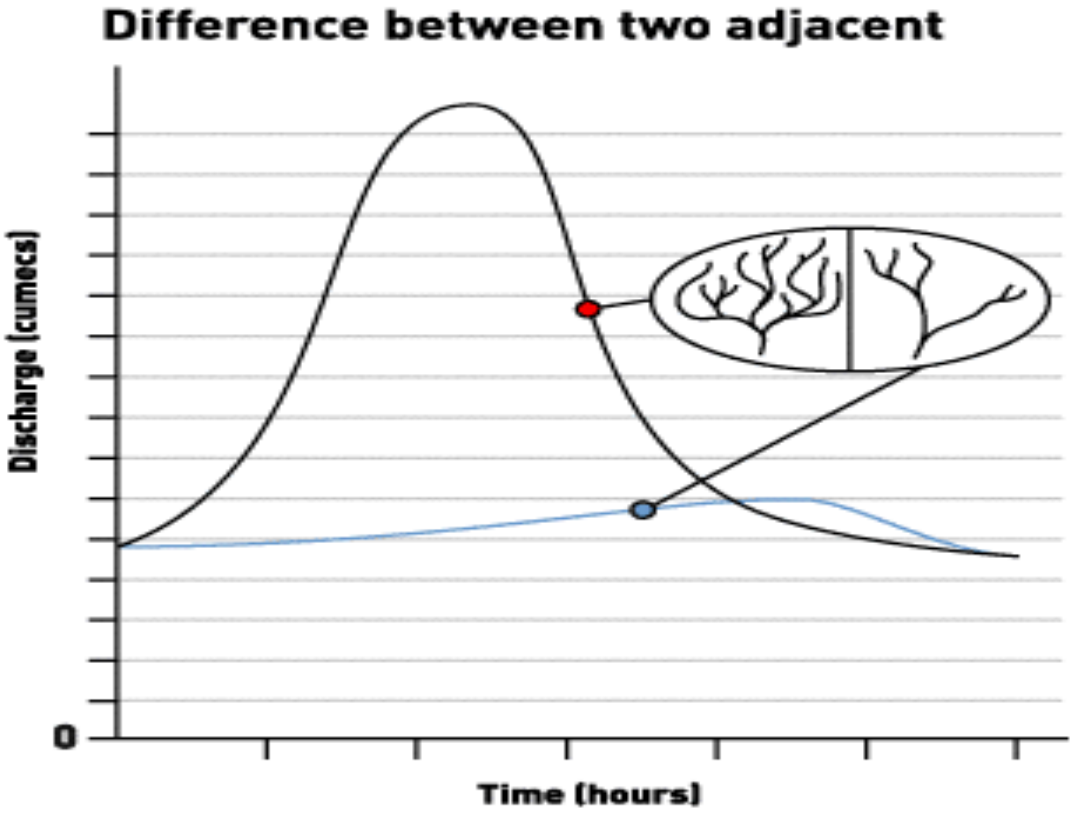


Interpreting a hydrograph

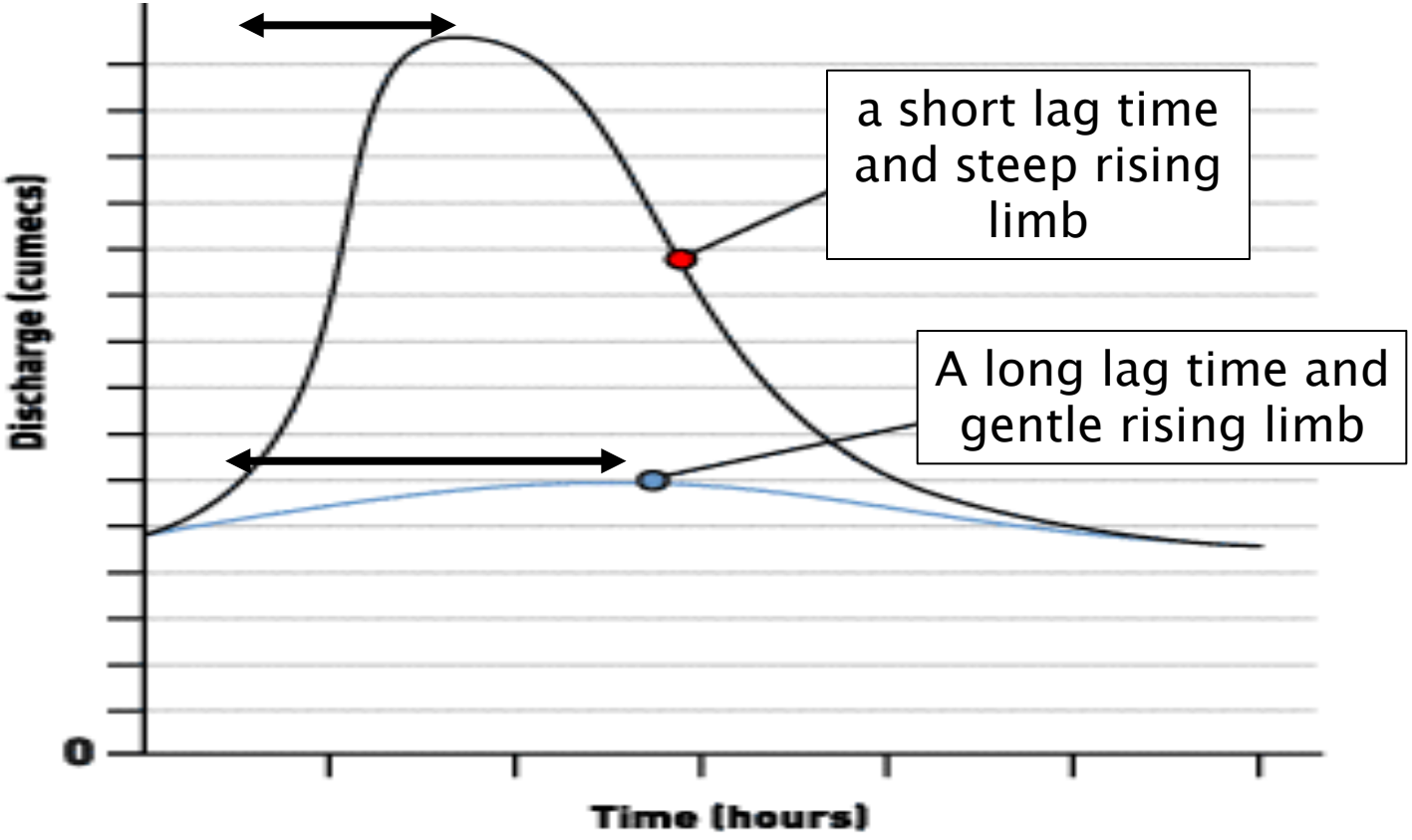
- You will be given four different hydrograph
- I want you to explain shown
  - What are the differences between the two lines? (rising limb, peak discharge, etc)
  - What is causing it and why?
- Remember to use key terms where you


Influence of steepness
Discharge (cumecs)
0
Time (hours)


Land Use
Discharge (cumecs)
0
Time (hours)
After Urbanisation
Before Urbanisation


Difference between two adjacent
Discharge (cumecs)
0
Time (hours)

Intensity of rainfall



The following situation will affect the hydrograph by producing either:

- **a) a short lag time and steep rising limb**
- **b) a long lag time and gentle rising limb**

For each select either a) or b) and explain your choice

- a rainstorm in an area underlain by granite
- a long period of 'drizzly' rain during the summer
- a snowstorm in the Highlands of Scotlan
- a thunderstorm in a city
- a rain event in a heavily forested area
- a period of showers in an area where the land has just been ploughed