The Great Flood of June 2007

MIKE AVERILL

Data supplied by the Environment Agency

Winter floods are the norm in most years but in 2007 there were two of the highest floods in the last 100 years, not in the winter as you might expect, but in the summer. This unusual wet summer period was caused by a large-scale weather pattern over the north Atlantic and Europe which developed in early June. The jet-stream, which generates and steers the weather systems, was found south of its normal position over the eastern Atlantic. This means that Atlantic weather systems were steered towards the UK, and tended to slow and "park" over the country. This led to more prolonged rainfall than in situations where the weather systems are usually more mobile. In addition, the persistent trough just west of the UK brought air from a more southerly track than normal, passing over warmer sea temperatures and therefore likely to carry more moisture. It is not currently known why this anomalous weather pattern developed and why it persisted over a month.

These events produced the highest rainfall ever recorded for both the months of June and July. Floods were widespread and in July they were severe along the River Severn below Worcester and along the River Avon, whilst in June the nature of the storms made the flooding confined to a band which fed up the western side of the Severn in to Shropshire (Fig1).

Whilst the rainfall in July produced an event which was exceptional by any standards it is the June storm which is the subject of this article.

After such extreme events it is easy to forget that the first eleven or twelve days of June were dry in most parts of the country. The weather culminating in the storm on the 19th of June began with low pressure dominating the weather from the 18th with a slow-moving depression deepening to the south-west of Cornwall before moving north-east across the country as it filled. Much of England, Wales and Ireland had enjoyed a very warm even hot summer day with plenty of sunshine developing through the afternoon of the 18th. The 19th dawned warm with clear skies with a plume of warm upper air situated across much of England and Wales; however a weak cold front began to approach from the west, introducing a much fresher air mass. By midday there were some very heavy showers with some funnel clouds being reported. The area north of Worcester towards Bridgnorth received more concentrated amounts of rainfall from 40 mm to 75mm in just two hours. Interestingly the edge of the rain band was very marked because only 6 miles to the east at Kidderminster it was a different story. From here the sky to the south west slowly darkened as a huge block of dark orange coloured cloud approached as the evening wore on and took on the look of a skyscape from an apocalyptic film. Clouds threatened for several hours but with only 6mm of rain falling at Kidderminster there was no idea of the torrents falling just 6 miles away.

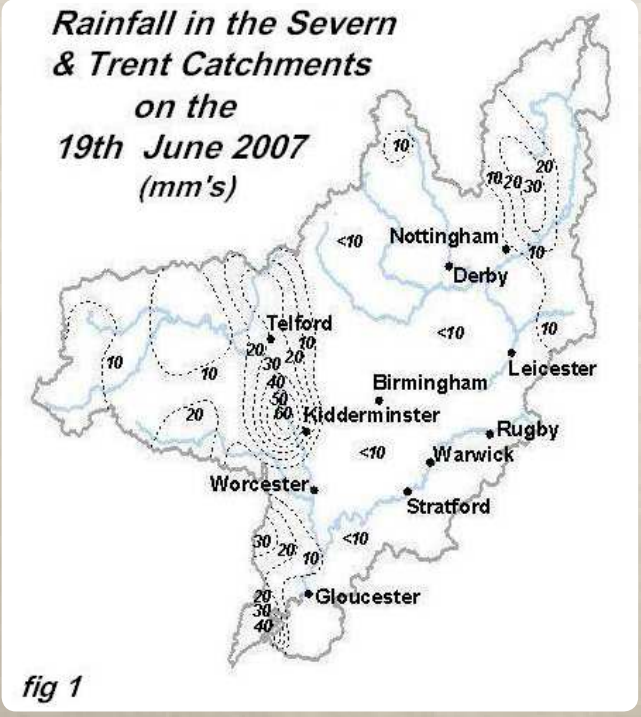


fig 1

In the Wyre, rain began falling at around 8 pm and by 11 pm, 58.8 mm had fallen at the recording station at Trimpley. (fig 2)

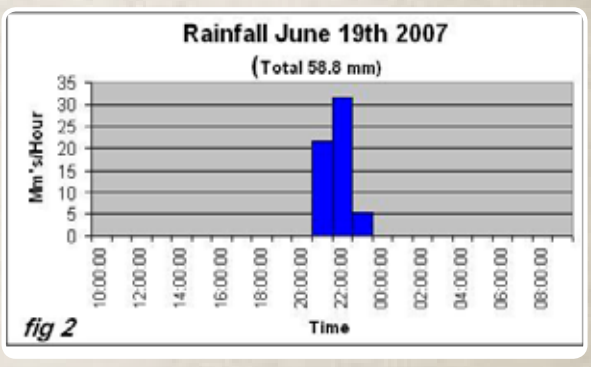


fig 2

Comparing the July 20th storm with the one in June (table 1 & figs 2 & 3) as much as 75 mm of rain fell over Wyre producing a peak, 100mm below the previous month. The reason why the second peak was lower despite more daily rainfall can be seen in figs 2 & 3. One of the reasons is due to the state of ground saturation, but the main reason is that in June the 58.8 mm fell

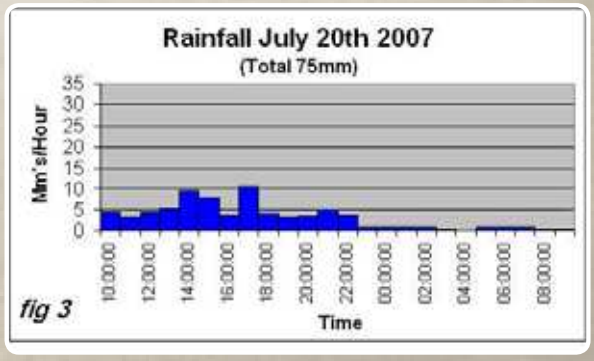


fig 3

mostly in just three hours whereas the July storm fell throughout the whole day allowing the water to drain away more slowly. At no time during the 20th July did the hourly rate exceed 10mm per hour.

Table 1
Summary of the rainfall totals during the two events in 2007

	June 19th	July 20th
Daily Rainfall (mm's)	58.8	75.0
% of Monthly Total	27.2	49.0
% of Monthly Average	104.6	137.9
Monthly Total (mm's)	216.0	153.0

Looking at the hydrology of the storm (fig 4), on the 19th June, 53.6mm fell in 2 hours over a catchment of 40.8 sq km's peaking with a flow of 65 m^3/second, which is equivalent to 17% of the peak in the Severn at Bewdley during times of flood. It was a good job for Bewdley that the Severn didn't have much water in it at the time. From fig 4 it can be seen that in 9 hours, 1300 cubic metres of floodwater had drained through the tributaries of Dowles Brook and was heading towards the Severn. When the floods receded there was a huge pile of rocks and boulders sitting in the middle of the Severn just where the Dowles runs in.

Only one other event is comparable to these two in living memory and that was the one resulting from the storms on the 31st May 1924. This event was rather like the July 2007 event but had rainfall totals approaching 100mm, but again spread over the whole day.

The 1924 event was a widespread rainstorm which caused flooding across much of the country. In Worcester, Pitchcroft was hosting the Three Counties Show at the time and so all the tents were flooded out. In the Dowles catchment, a record of this event is captured in the marks on the mill doorway at Knowles Mill (see page 12). The June 2007 event exceeded this mark by 50mm whereas the July flood failed to reach the mark by 50mm.

How intensity of rainfall can produce different floods is interesting and if it is very intense it can produce spectacular peaks as seen on the Dowles in June. The most intense rainfall recorded in the British Isles was 279mm's in 24 hours at Martinstown, Dorset on 18/07/1955. The infamous flood at Lynton and Lynmouth in 1952 produced 242 mm's in 24 hours and more recently in the Boscastle storm of 2004 some 200mm's fell in a day. What made Boscastle devastating was that it was all in four hours.

The highest hourly total in the UK is 92mm at Maidenhead on 12/07/1901 and for two hours it is 193mm in Yorkshire on 19/05/1989 so the Dowles event of 53.6mm's in two hours could have been equal in magnitude to that of Boscastle if it had continued raining at the same rate for four hours.

Will there be another summer flood of the magnitude of June 2007? Opinion on climate change suggests that rain storms will increase in intensity but that the overall amounts will not increase by large amounts and so only time will tell if there is to be another Great Storm in the next 200 years.

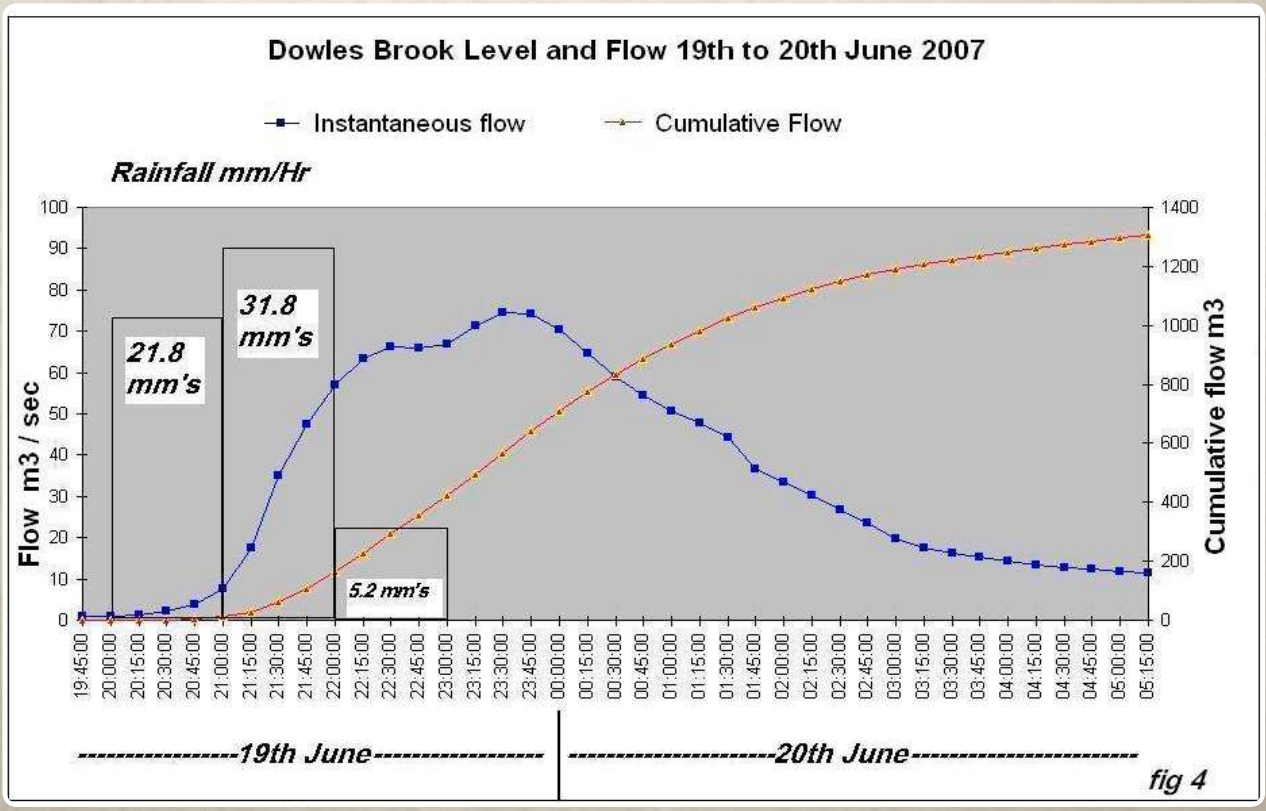
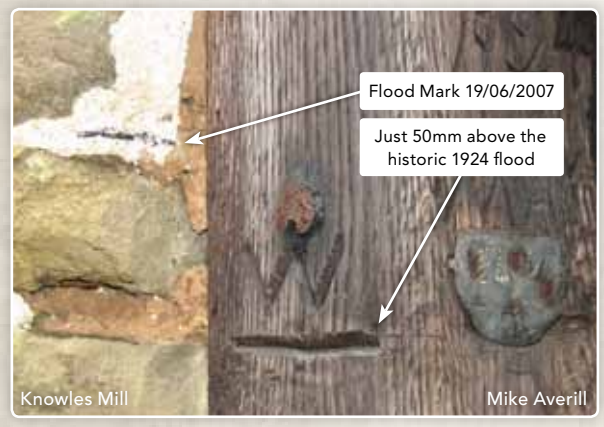


fig 4



The Flood Mark from June 19th at Knowles Mill, Wyre Forest

There has been a river measurement station at Oak Cottage at the bottom of Dry Mill Lane since 1971; this station continuously measures river levels and flows. Historically the only records available before the advent of detailed measurements would be the marks made on buildings like the doorway at Knowles Mill. The June 19th flood in 2007 was 50mm higher than the 1924 mark. Later that year the second summer flood on the 20th July reached to a level 50 mm below the 1924 mark. Due to a deep depression passing over the country on the 31st May, nearly 100mm of rain fell and resulted in the flood of 1924. The rainfall was heaviest in the West Midlands and into Shropshire.

On 19/06/2007, 53.6mm of rain fell in 2 hours over the Dowles catchment of 40.8 sq km's which represents 2.19 million cubic metres of water. Just four and a half hours after the rain started a peak flow of 65 cubic metres a second was reached at 11:30 that evening. (fig 4)

Analysis has shown that the Annual Exceedance Probability of the flood was 0.5% for the June event and 1% for July (in other words the there was a half a percent chance of the June flood occurring in any year, or it was a 1 in 200 year event, whilst the July flood was a I in 100 year event).