Kingston Brook – our concerns

From Wikipedia:

Kingston Brook is a small river in central England. It arises near Old Dalby, Leicestershire on the northern edge of the ridge running from Normanton-on-Soar, Nottinghamshire to Belvoir, Leicestershire. It runs through Willoughby on the Wolds, to the south of Wysall (where it picks up a number of minor tributaries), Costock, East Leake (where it is joined by Sheepwash Brook), West Leake and meets the River Soar near Kingston-on-Soar.

The information for this poster is taken from:
1) two studies of the ecological and habitat quality of Kingston Brook undertaken by Ian Morrissey in 2002 and 2012, and a summary survey he carried out in 2018.
2) An archaeological survey by Ursilla Spence (County Archaeologist) and Emily Gillott (Community Archaeologist) in 2016.

Kingston Brook forms the centrepiece of Meadow Park, flowing from Gotham Road for approximately 600m before its exit from the park under the Great Central Railway line. In the park there are three bridges over the brook; Heron Bridge, Kestrel Bridge and Kingfisher Bridge.

Healthy stream systems are major contributors to local biodiversity as they provide habitat for fish, aquatic macro-invertebrates (e.g. crayfish, snails and aquatic life stages of insects such as dragonflies and mayflies), aquatic plants which in turn support a wide variety of aquatic mammals (otters, water voles) and birds. However, the Kingston Brook currently suffers from both habitat and water quality issues which result in a water-course that falls someway short of its potential as an ecological diversity hotspot within Meadow Park. The Kingston Brook is in fact recognised by the Environment Agency as being in “Poor Ecological Status” as assessed under the Water Framework Directive (see https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028046600)

From historical mapping, aerial photographs and ground level data (see Figure 1) it is obvious that the section of Kingston Brook that flows through the park and the recreation ground has been moved from its original meandering course, straightened and further modified to improve land drainage for agricultural purposes and to reduce flood risk. This human intervention predates the Enclosure Map of 1798, which shows Kingston Brook as flowing along its current alignment, and is a familiar picture for most of the watercourse’s extent and that of other systems within the UK.

For centuries before enclosure the area of Meadow Park was likely managed as a natural floodplain environment. On these new plains grass could be encourage to grow much earlier in the season through water level management making the floodplain suitable for cattle grazing from anything up to three weeks earlier than elsewhere in the catchment. Play Field is the clearest example of being a long-term floodplain. Changes to East Leake's economy in the 19th century saw basket making established as a village industry. An archaeological survey carried out in 2016 showed willow beds were planted as the brook was modified just downstream of Kestrel Bridge. The stone and brick work immediately downstream of the bridge was probably to funnel water into a narrow sluice to provide the right conditions for growing willow. Alternatives have been suggested, including an old bridge crossing or even a site of a watermill.

The outcome of all this change of use resulted in the brook being made straighter and in some sections, deeper. This has been accelerated with the perceived need to reduce flood risk in more recent times. Overall this has led to a reduction of instream physical habitat complexity and alteration to the natural flow pattern through the removal of the meandering planform and loss of natural riffle (shallow stony sections) and pool (deeper sections typically on bends) sequences. Add to this an increase in runoff rates from the surrounding land, due to the arterial drainage network and urban development, the brook experiences a very different flow regime, characterised by flashy high flow events as rainfall quickly makes it to the main channel.

It is not just the Kingston Brook itself that has changed as a result of human interference. The land adjacent to the brook has been managed so that a narrow strip of willow, hawthorn and elder is now all that lines the banks. This acts to reduce habitat diversity as well as the supply of valuable organic matter in the form of leaf litter, which along with aquatic plants forms the basis of the food web, required to maintain a healthy macro-invertebrate and fish community. The use of fertilisers and pesticides on surrounding agricultural land and storm drains entering into the brook further act to constrain the ecology of the watercourse through the effects of pollution and nutrient enrichment.

Successive dredging of the streambed and widening of the channel by the local drainage authority maintains the heavily modified condition of the brook. As a result of the oversized channel the brook suffers, particularly during low flow conditions, due to a significant reduction in local stream velocity. This causes fine sediment to settle on the streambed leading to further habitat and ecological degradation through the effects of smothering. Obviously it is difficult to balance the need for drainage in times of heavy rainfall and flooding with the requirements of a healthy brook. Ways of getting a better balance are currently being discussed with the Trent Valley Drainage Board, a fairly recently created body with a reputation for making positive changes in a sensitive way.

Surveys of Kingston Brook in Meadow Park 2002 and 2012

Ian Morrissey surveyed the Kingston Brook in 2002 and 2012 and was able to compare the results to assess its quality. Three features were investigated to support an assessment of the "health" of the watercourse:

1)Aquatic macro-invertebrate species richness and abundance *(organisms without spines, but are large enough to see with the naked eye e.g. flat worms, aquatic insects life stages and crayfish*). The variety of macro-invertebrate within aquatic systems is a commonly used biological measure of "health".

2) Macrophyte species richness and distribution *(that is aquatic plants that grow in or near water*). In watercourses macrophytes provide cover for fish and aquatic invertebrates, produce oxygen and act as food for some fish and wild life.

3) The physical habitat structure and water chemistry.

Summary of the survey of macroinvertebrates and physical habitat of Kingston Brook 2002

In 2002 aquatic macro-invertebrates were collected from five locations along the brook in the park using standard Environment Agency sampling methods (see drawing/plan provided as Figure 2). This sampling yielded a total of 26 aquatic macro-invertebrate taxa, including caddisfly larvae, mayfly nymphs, molluscs and leeches, all of which are typically found in lowland stream systems like Kingston Brook. The types and distribution of the species recorded were indicative of periodic reductions in water quality and varying levels of habitat degradation across the sites sampled (see full report for more details).

Of particular note was the contrast between the range of species recorded at sites 1, 2, 3 and 4 (range 5 – 12 taxa; indicative of a highly stressed and impoverished community) and the number recorded at Site 5 (21 taxa). This notable difference between the numbers of species that were supported at each of the sites was attributed to differences in physical habitat condition. Site 5, located just upstream of the railway viaduct was the only site characterised by the presence of a clean gravel bed (riffle), indicating that historically this section of the watercourse had escaped significant dredging interventions. It was argued that the presence of riffles at Site 5 helped to locally increase oxygen concentrations and prevent settlement of fine sediment resulting in an improved environment than that recorded at Sites 1, 2, 3, and 4 (where silt bed and low flow rate predominate).

The water quality was assessed and the presence of nitrate and phosphate (nutrient) concentrations were within the expected range for a stream receiving moderate levels of organic pollution from the surrounding catchment and the Biological Oxygen Demand (BOD) classified water quality as fair/good. There was some concern over the quality of water entering the brook from the storm drain located between Site 2 and Site 3. Water sampled from the inflow had much higher levels of phosphate and ammonia than those recorded in the stream water.

To summarise the findings in 2002 poor physical habitat quality combined with periodic reductions in water quality within the Kingston Brook were the primary reasons for the limited range of aquatic macro-invertebrates and their distribution within the brook.

2010 work to relieve flooding in the park and East Leake

Channel and bankside works carried out in March 2010 by the Kingston Brook Internal Drainage Board (now replaced by the Trent Valley Internal Drainage Board) were counter to the maintenance of habitats required for watercourse wildlife to flourish i.e. the works resulted in the loss of native Black Poplar trees planted by Friend of Meadow Park and removal of gravels from the bed of the brook.

More recently (January 2019) the maintenance works by the Trent Valley Internal Drainage Board were undertaken with much more regard for the watercourse and bankside ecology within Meadow Park and in the manner communicated to the Friends of Meadow Park. This is an encouraging step in the right direction.

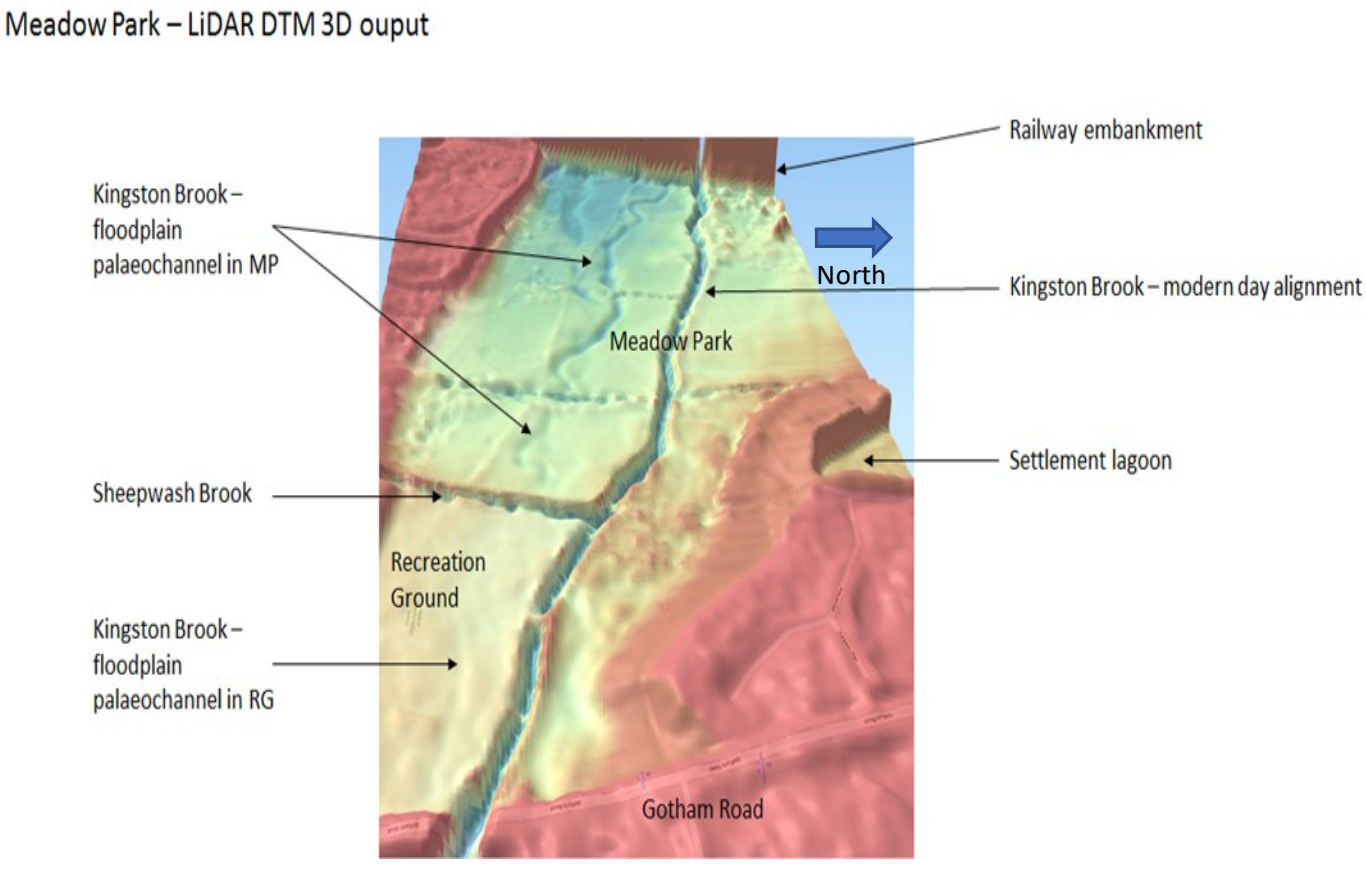

Figure 1: Lidar image showing current and historical alignment of the Kingston Brook through Meadow Park (elevation ranging from Blue (low) to Red (high)

Summary of the survey of macro-invertebrates and physical habitat of Kingston Brook 2012

The survey in 2012 was carried out in September, six month after the Kingston Brook Internal Drainage Board had completed their maintenance within the park.

Aquatic macro-invertebrate data again indicated the presence of an impoverished aquatic community within the Kingston Brook, with only 23 species being recorded across the 4 sampling sites (noting that Site 1 was excluded from survey in 2012 due to access constraints). Site 5 (which had not been dredged during the works) supported more species compared to the other sites sampled (18 taxa), again indicating the important link between habitat quality and ecology.

In comparing the 2002 and 2012 surveys it was concluded that the maintenance works undertaken in March 2012 had had neither a positive or negative effect on the aquatic life in the brook. This could be seen as justification for maintaining the status quo in terms of the maintenance regime along the brook through Meadow Park. However, this lack of response to human intervention is indicative of the ecology of habitats that typified by the presence of a limited number of species that are insensitive to further habitat degradation.

What this means for the Kingston Brook is quite simple, in order to improve its ecological value, remove and/or address the reasons for poor habitat and water quality.

Caddisfly adult

Mayfly nymph (left), dorsal view, showing the paired gills and three projections on the abdomen; Caddisfly larva (right) living in its case made of sand grains

Caddisfly larva

Flatworms are actually many different animals from several major unrelated invertebrates that share a similar body shape. Worms generally have long thin and soft bodies.

What do we do next?

Currently the Parish Council and the Friends of Meadow Park committee are consulting with the Trent Valley Internal Drainage Board to find better ways of managing the Kingston Brook in Meadow Park. We are pushing for a more positive focus on how to improve the watercourse habitats and ecology in line with key legalisation (i.e. requirements under the Water Framework Directive) but recognise concerns around flood risk in the village. Fortunately for the Kingston Brook there is growing national recognition that river restoration plays in important role in natural flood management, whilst at the same time benefiting the ecology and reducing the need for intrusive on-going maintenance.

Like everything, any works to improve the Kingston Brook would need funding and we need to see which funding bodies we are eligible to apply to as a group. Also, though we are focusing on Meadow Park, whatever we do will inevitable have an impact on the brook before and after it enters the park, so some careful thought is required.

We very much hope to make some improvements in the watercourses in Meadow Park, but do not expect these to happen for a little while.

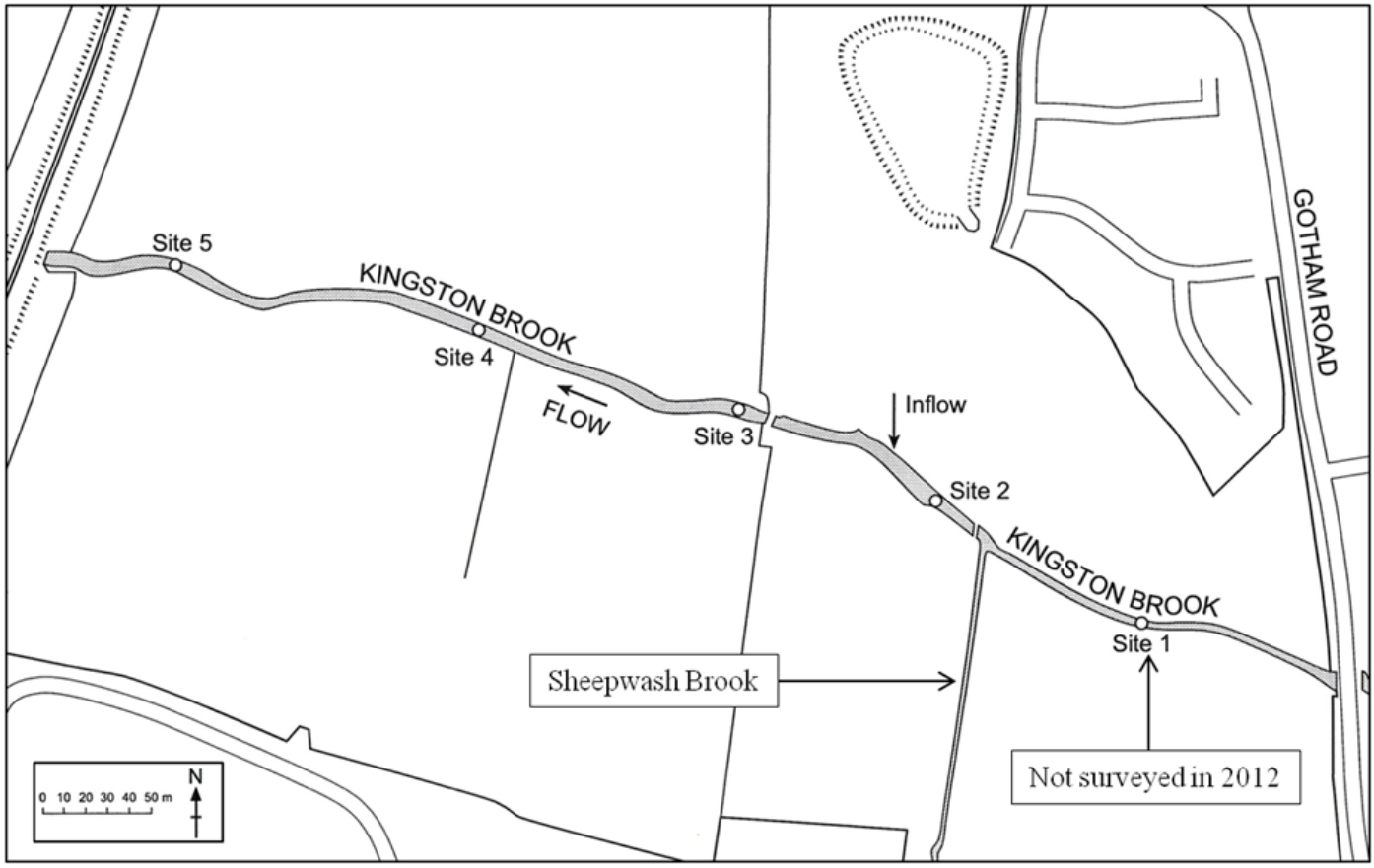

Figure 2: Location of survey sites on Kingston Brook, Meadow Park

This article is available on the village web site. Please go to 'Organisations' and click on Meadow Park to find it. Friends of Meadow Park will be emailed a copy in the October news update. East Leake library has copies of Ian's reports.