River Crane
2012-2013 Water Quality and Ecology Overview

Monitoring the natural environment is a powerful tool to ensure its continued protection. Heathrow Airport uses specialist contractors to monitor the River Crane for water quality and biological indicators, including aquatic macro-invertebrates and fish.

This fact sheet provides some of the highlights of the monitoring data collected by Heathrow Airport during the course of 2012 and spring 2013 and focuses on the section of the River Crane east of Heathrow Airport and upstream of the Duke of Northumberland's River and Crane Valley Nature Park.

Water Quality

Good water quality is a fundamental requirement for aquatic life as well as for humans and is often referenced against a set of standards. For rivers, currently the most important piece of legislation is the EU Water Framework Directive (2000/60/EC) or WFD, which requires all European water bodies to achieve at least 'good ecological status' and combines physical, chemical and biological parameters. Six main water chemistry standards have been set for the Water Framework Directive and the performance of the River Crane against these standards is described in the table below.

Table: Performance of a section of the River Crane monitored by Heathrow Airport during 2012-2013 against the main Water Framework Directive water chemistry standards (as set out in DEFRA, 2010[1])

	WFD standard for "good" status	Performance of River Crane against the WFD standard	
		Upstream airport outlet	Downstream airport outlet
Dissolved Oxygen	60% saturation (90% of the time)	Standard met, but some oxygen concentrations were below the standard	Standard met, but some oxygen concentrations were below the standard
Biochemical Oxygen Demand	5 mg/l (90% of the time)	Standard met, with some elevated results found	Standard met, with some elevated results found
Acidity: pH	between 6 and 9	Standard met	Standard met
Water temperature	28°C	Standard met	Standard met
Ammonia	0.6 mg/l	Standard met	Standard met
Phosphate	0.120 mg/l	Standard not met	Standard not met

Fish and other aquatic animals depend on the concentration of dissolved oxygen present in the water to live. Oxygen concentrations in the River Crane were generally quite good and appeared to meet the WFD standard set for lowland rivers. Occasionally, the oxygen concentration was below the standard both upstream and downstream of the airport outlet, often occurring at the same moment in time both upstream and downstream of the airport outlet, suggesting that the source is likely to originate from further upstream.

Directly related to the oxygen standard is Biochemical Oxygen Demand (BOD), which is a measure for how quickly oxygen is used up in the system; usually by bacteria breaking down organic matter. Spot sampling data reveals that BOD in the River Crane upstream of the airport outlet exceeded the WFD standard twice in 2012 and once in 2013. In these cases, the BOD was high both upstream and downstream of the airport outlet. At one occasion, the BOD was higher in the downstream section and not upstream.

None of the temperature or pH measurements in the River Crane were outside the standards set by the WFD during 2012 and none of the quarterly samples taken from the River Crane during 2012 and 2013 exceeded the standard for ammonia.

All quarterly samples taken upstream and downstream of the airport outlet in 2012 and 2013 exceeded the WFD standard for phosphate upstream and downstream of the Airport outlet, highlighting this as a concern for the River Crane.

Aquatic Ecology

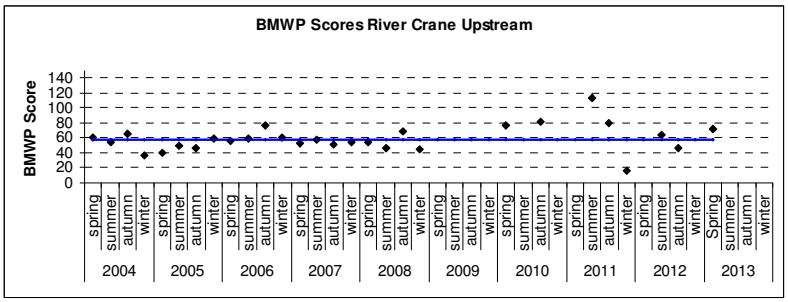
Aquatic macro-invertebrates are animals that live on or around the bottom of the river or amongst plants, or in the margins and which can be seen with the naked eye. In the UK, the Biological Monitoring Working Party (BMWP) methodology uses aquatic macro-invertebrates as an indicator species for the long-term water quality of rivers and lakes, particularly in relation to oxygen concentrations and organic pollution. When chemical spot samples are taken, they are really a snapshot of the water quality at that moment whilst macro-invertebrates are living there all the time and provide a long-term measure.

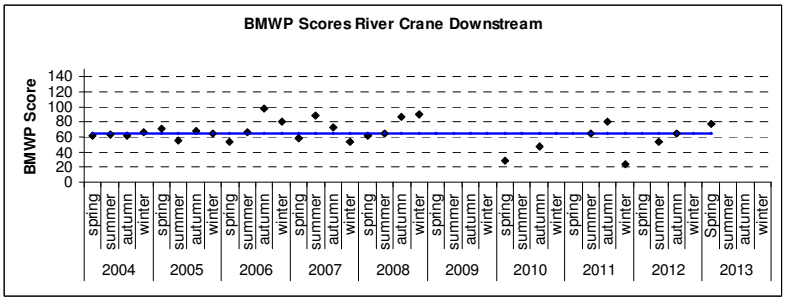
Macro-invertebrate samples are collected using kick sampling, where a net is placed downstream from the sampler and the river bed is agitated with the foot for a standard period of time, allowing comparison of the sample data over time.

The BMWP methodology assigns a score between 1 and 10 to a range of macro-invertebrate taxa based on their known sensitivity towards organic pollution and oxygen requirements. Taxa most tolerant to organic

[1] DEFRA (2010) River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Direction 2010, ISBN 978-0-85521-192-9

pollution have a low BMWP score (down to 1), whilst those least tolerant have a high score (up to 10). The combined sum of the taxa scores from a sample is the BMWP score, which is a useful measure of diversity and the general "health" of a community.





Data has been collected for nearly ten years around the airport outlet and historical data upstream and downstream of the outlet has been shown in the two graphs on this page. The blue line refers to the average BMWP score found over the duration of the monitoring period. The River Crane upstream of the airport outlet has an average BMWP of 58.1 (with a variation in the data of ±17.9) for the period between 2004 and 2012; whilst downstream a BMWP score of 64.8 (±16.7) has been found. The 2012 and 2013 BMWP scores are just below or above the average scores again with all samples taken in March 2013 exceeding the annual averages. Lower scores have been found in winter 2011, when in-stream diversity and consequently biological scores were affected following a loss of sewage at the A4 Bath Road.

Fish

Fish surveys undertaken in October 2011 provided a valuable baseline of the fish population upstream and downstream of the EBR outlet. Our surveys revealed that the River Crane has a reasonable population of coarse fish such as dace, chub (see photo), roach and gudgeon. There is also evidence of successful recruitment within the dace, chub and roach populations with several different year classes present. The general catch appeared lower downstream of the airport outlet when compared to the site upstream, but having conducted a further investigative run, this revealed that a good mix of coarse fish species in reasonable numbers were shoaled in a deeper pool just outside of this lower survey section. Further surveys will highlight any longer term trends.

Figure: Mature chub (*Squalius cephalus* – left) and roach (*Rutilus rutilus* – right) caught in the River Crane in 2011