

Malago River Executive Summary

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Project aim

An investigation was conducted on the Malago River in Manor Woods Valley, with the aims of:

- Mapping the previously unplotted path which runs along the eastern bank of the river, to aid ecological surveys.
- Assessing the water quality of the river in terms of ammonia, nitrite, nitrate, phosphate, and microplastics.

Due to the time of year of the data collection, it was not possible to quantify the effects of the water quality on the biological activity of the river.

Questions proposed:

1. *Do ammonia, nitrite, nitrate, phosphate concentrations and E-coli counts fall within standards for high quality water, from the Environment Agency (2011) and Bristol City Council (2018).*
2. *Do microplastics build up in front of the dam on the River Malago, degrading the water quality?*
3. *Does nitrite concentration increase in the sediment rich water before the dam, whilst oxygen saturation decreases?*

What we did to investigate them:

Field: water quality (pH, oxygen, conductivity), discharge, took water samples

Lab: BOD, turbidity, chlorophyll, microplastics, gallery data

Secondary Data: E-coli counts in the Malago River from Bristol City Council

GPS mapping:

We used handheld GPS units to map the footpath on the eastern side of the stream. This was then merged with existing map data¹, and contour data derived from LiDAR (Light Detection And Ranging) data² using a GIS software (ArcMap). We then added a 100m grid to aid with surveys in the future. A Google Drive folder with JPEG files of this map and the ArcMap project file has been shared with the MVCG. A scaled down preview of the map with the new path highlighted is attached at the end of this document.

What we found:

With the data we collected, we were able to answer the questions proposed at the beginning of the investigation about the Malago River.

1. Do ammonia, nitrite, nitrate, phosphate concentrations and E-coli counts fall within standards for high quality water, from the Environment Agency (2011) and Bristol City Council (2018)?

- In general, the water quality fell within Environment Agency (2011) standards, suggesting that the Malago's water quality is very good in terms of ammonia, nitrite, nitrate and phosphate concentration.
- However, previous research has suggested that the water quality may change with rainfall events as pollutants are flushed into the river.
- This may especially be the case for the Malago since the catchment is surrounded by allotments where fertilisers may be used.
- E-coli counts from Bristol City Council (2018) suggested that on numerous occasions in the last 13 years, counts exceeded the recommended 10,000 counts/L by the Environmental Agency (2011).

2. Do microplastics build up in front of the dam on the River Malago, degrading the water quality?

- Contrary to studies of large scale dams, results from the Malago suggest that microplastics have not accumulated most behind the dam in the river and hence, the microplastic level is not affected by the dam.
- There is, however, evidence of significant microplastic accumulation along the length of the stream, suggesting that microplastics are entering the river in Manor woods. This is likely due to the large quantity of plastic litter in the valley.

¹ OS Vector Map Local [SHP geospatial Data]. Scale: 1:2500. Updated January 2018. Ordnance Survey, GB. Using: EDINA Digimap Ordnance Survey Service.<<http://edina.ac.uk/digimap>> [Accessed: March 2018].

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3. Does nitrite concentration increase in the sediment rich water before the dam, whilst oxygen saturation decreases?

- Nitrite concentration does increase in the sediment rich water before the dam, where there is a low oxygen supply.
- It is suggested that this increase is due to the conversion of nitrate to nitrite in lower oxygen conditions
- However, this increase does not degrade the water quality significantly according to Environmental Agency standards (2011).

Advice for Malago Valley Conservation Group:

In light of the results of this investigation, it is suggested that Malago Valley Conservation Group implement a number of strategies to maintain the quality of the Malago River and the health of the aquatic life it supports.

- **A strategy to prevent plastic littering in and around the river:** microplastics accumulated downstream suggesting they are sourced from within the reach. A campaign will reduce the inevitable breakdown of this litter into microplastics and reduce the harmful impact this has on aquatic life.
- **A campaign to encourage the public to pick up after their dogs when walking:** E-coli is harmful to aquatic life and predominantly stems from faecal contamination. Because E-coli counts have often been observed to exceed Environment Agency standards for bathing water, the picking up of animal waste in the surrounding area would benefit the river's health.
- **Regulation of the extent of fertilizer used in the allotments:** Fertilizers contain ammonia, which can deplete aquatic populations if found in excess in rivers. The concentrations of ammonia identified in the river fell comfortably within high quality Environmental Agency standards, however, the results were taken during dry weather conditions, when there was little or no runoff from the river banks. Limiting runoff from ammonia fertilizers is encouraged.

Suggestions for future research:

- **Studies focusing on the ecological impact of the Malago's water quality:** Having established the chemical water quality of the stream, it is recommended that further ecological surveys, such as kick sampling, chlorophyll monitoring and bacterial activity measurements are undertaken in the summer when meaningful data can be collected.
- **Further water quality data investigations to assess annual changes and effects of different weather conditions:** The results from this investigation would very likely be substantially different if repeated in the summer or during periods of high rainfall and discharge. Therefore, quantification of these differences will provide a more comprehensive overview of the general river water quality.
- **Further investigation into microplastic pollution, avoiding the use of plastics for analysis where possible:** A major drawback to the microplastic investigation was the reliance on plastics in much of the lab equipment. For proper analysis of microplastic pollution on the Malago, we recommend repeating the study, using glassware and avoiding potential sources of contamination wherever possible.

