

Invertebrate Survey of Coopers Water near Dundrod,

Co. Antrim - February 2023

1. Background

Following the report on the 12th of February 2023 of a fish kill in the Crumlin River, Co. Antrim, by a member of the Crumlin and District Angling Association, [REDACTED] NIEA Water Quality Inspector (WQI), carried out an initial survey and confirmed a pollution incident had taken place. On 17th February 2023 [REDACTED] NIEA Regional Operations Team, requested for an ecological survey to be carried out on Coopers Water. This tributary is in the upper reaches of the Crumlin River, near Dundrod, Co. Antrim. The purpose of this investigation was to provide ecological data to help identify potential sources of pollution and assess any impacts on the local freshwater invertebrate community.

2. Method

NIEA Freshwater Monitoring and Assessment (FMA) team ecologists, [REDACTED] and [REDACTED], met [REDACTED] (WQI) on the morning of 22nd February 2023. Six sites were selected and surveyed. Invertebrate samples were collected at all six sites by [REDACTED] in accordance with procedure M0056. Due to internal resource pressure, the samples were prioritised, and four invertebrate samples were selected and analysed between the 22nd and 24th February 2023, by [REDACTED] in accordance with Procedure M0057. Procedures M0056 and M0057 are in compliance with ISO17025. The remaining two samples were preserved in 80% ethanol solution, however, the results indicated further analysis of these samples was not required. The locations of the four sites that were analysed are shown in Figure 1. Photographs taken on the day of sampling can be viewed in Appendix 1.

3. Results

The samples were analysed using the Walley, Hawkes, Paisley, Trigg (WHPT) method that uses families of macro-invertebrates as biological indicators and were then classified using the invertebrate classification tool RICT2. The results and status assessments are provided in Table 1. The boundary values for the classes for each site and the observed Ecological Quality Ratio (EQR) are provided in Figure 2.

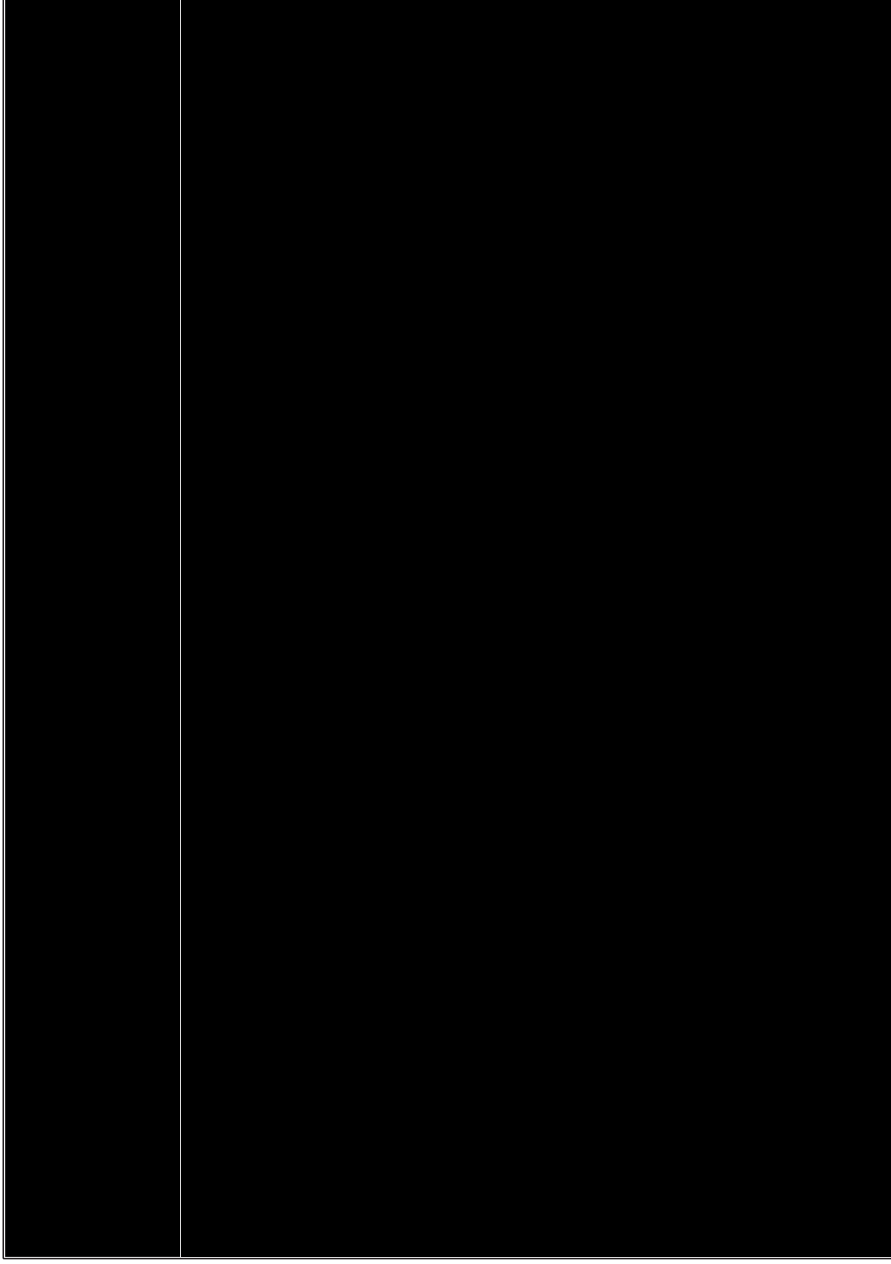


Figure 1: Map showing the locations and results of the four Investigative sites sampled on the 22nd February 2023 -
Coopers Water fish kill investigation.

Site No.	Location	Date Sampled	Date analysed	Biotic Score	No. of Taxa	ASPT	Field Notes	Class
CRM1		22/02/2023	23/03/2023	225.4	31	7.27	No visible signs of pollution. Evidence of organic farm material in field and on riverbank downstream from . No previously deceased inverts in sample. No sewage fungus found.	H
CRM2		22/02/2023	24/02/2023	152.5	25	6.1	Large amount of organic material and sediment on stones. Odour from water and sample. Unusual amount of litter in stream. Dead <i>Gammaridae</i> shrimp and <i>Limnephilidae</i> caseless caddis in sample. Large number of single specimens in sample. Higher abundances of deceased invertebrates in sample compared to other sites. <5 % sewage fungus found under stones.	M
CRM3		22/02/2023	23/02/2023	181.9	26	7.00	River in spate and turbid. Large amount of organic matter in net and on stones. Agricultural smell from water. Live invertebrates on substrate. Dead <i>Gammaridae</i> shrimp, <i>Leuctidae</i> stoneflies, <i>Rhyacophildae</i> caseless caddis and <i>Limnephilidae</i> cased caddis in sample. This sample does not appear to be as healthy as CRM4. <5% sewage fungus found above and below stones. 0.1% <i>Leptodictyum riparium</i> moss	G
CRM4		20/02/2023	22/02/2023	226.8	34	6.67	One 5cm dead fish recorded on site (possibly trout). River in spate and very turbid. Organic matter on stones. Obvious plume from Sycamore Road tributary, which is heavily discoloured and extremely turbid. <5% sewage fungus found under stones and between 5-30% found above.	G

Table 1: Table showing the WHPT scores, field notes and classification results for sites surveyed on the 22nd February 2023 on Coopers Water fish kill investigation near Dundrod.

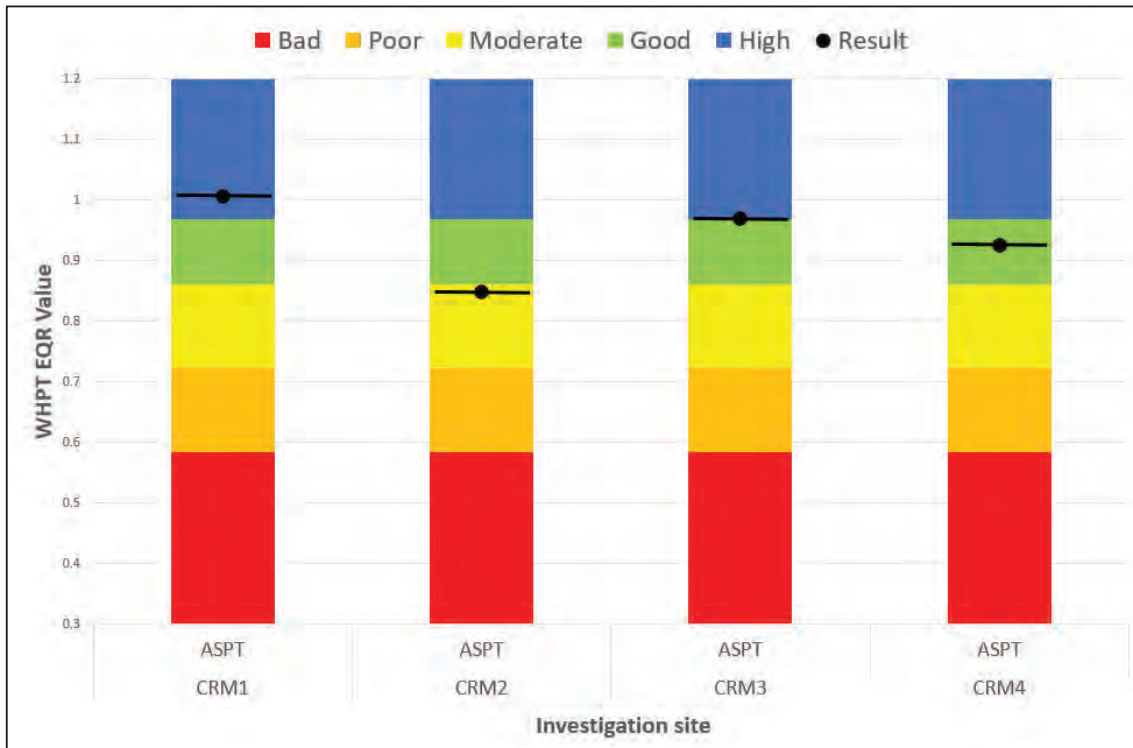


Figure 2: Classification boundary graph showing the EQR values for each site.

Note on Figure 2

RICT produces a class by producing two separate classifications; one is based on the WHPT Average Score Per Taxon (ASPT) result and another on the number of taxa found in the sample (NTaxa). Whichever has the lower EQR value between both criteria is the single classification that is then used. A site that classifies via ASPT could potentially indicate organic pollution, along with nutrient and low flow issues, where dissolved oxygen levels are lower than expected. A site that classifies via NTaxa can indicate morphology issues or toxic pollution e.g. acidification, metals or chemicals such as cypermethrin. All the sites analysed for this investigation classified via ASPT.

4. Discussion

Site CRM1 is located immediately upstream of a [REDACTED] that has been identified as a potential source of pollution for this investigation. Site CRM1 achieved the highest ASPT of all the samples in this survey, and despite having the second highest abundance score, it was evident from the sample analysis (see raw data) that there was a greater abundance of pollution sensitive invertebrate families compared to the other sites. CRM1 showed no visual indicators or ecological evidence of pollution during the onsite inspection by NIEA freshwater ecologists, with this site not appearing to have been impacted by any sources of pollution from further upstream. This site classified as “High” status.

A field located downstream of CRM1, situated between the [REDACTED] and riverbank, showed signs of recent possible spreading or discharge of a large volume of organic matter. An inspection at this downstream location showed that some effluent had flowed through the fence in the lower part of the field and onto the riverbank.

CRM2 is located five hundred metres downstream of the [REDACTED] and showed recent deposits of organic material and fine sediments on the river substrate above and below the water level. A strong odour from the collected sample, and from the water surface itself, was noted during sampling. Overall CRM2 achieved the lowest biotic scores and number of taxa found at any of the sites analysed during this survey. Further analysis revealed that only single specimens were present for four out of the five most pollution sensitive taxa. Removing the scores of these sensitive taxa would have further reduced the scores shown in Table 1. Overall, nine out of twenty-five recorded taxa at CRM2 were single specimens in the sample. Dead *Gammaridae* shrimp and *Limnephilidae* cased caddis were noted on site.

It is evident that this site has recently been impacted by an upstream discharge of biodegradable organic matter, as large amounts of fine, organic debris were noted in the sample and on the substrate. A higher-than-normal amount of litter was also recorded within the riverbed. This site classified at Moderate status, however, Figure 2 shows that this classification was close to the

Good/Moderate boundary. Any further impacts or prolonged pollution exposure at this site may result in the disappearance of the single specimen species from the habitat, which in turn, could negatively affect the overall classification.

CRM3 is located [REDACTED]

[REDACTED] Large amounts of organic matter were present in the net and on the river substrate. Dead *Gammaridae* shrimp, *Leuctridae* stoneflies, *Rhyacophilidae* case-less caddis and *Limnephilidae* cased caddis found in this sample. A dead fish was also found at this site by the WQI during the initial investigation. From the invertebrate results it appears the impact from the upstream discharge was somewhat diluted at CRM3, with this site classifying at “Good” status and the ASPT and biotic scores having improved from those seen upstream at CRM2.

The WHPT data produced at CRM3 is lower than that produced at CRM4. however, both sites obtained a Good classification. On inspection of the EQR values (Figure 2), CRM3 classified closer to the High/Good boundary, which may imply minor impacts from the incoming tributary between sites CRM3 and CRM4.

CRM 4 is located forty metres downstream of confluence with [REDACTED] tributary. One dead 5cm fish was noted on site, along with dead *Gammaridae* shrimp in the sample. Large amounts of organic material were noted on the river substrate and in the sample net. There is a notable change in water colour/clarity at this site and the ecologists were unable to properly view the obstructed riverbed. CRM3 and CRM4 were selected for analysis because the WQI stated that ‘highly turbid’ water was flowing into Coopers Water from a small tributary in the vicinity of [REDACTED] (see Map 1). This turbid water was most evident at the time of sampling (See photograph 9 in Appendix 1). The origin of this ‘turbid’ water requires further investigation by the WQI.

Sewage fungus was noted above and below the stones at CRM4, along with higher numbers of *Oligochaeta* worms and *Chironomidae* midge larvae than that seen at CRM3, CRM2 and CRM1. This ecological evidence suggests ongoing low level biodegradable organic pollution is entering Coopers Water

from the [REDACTED] tributary, even though this site achieved “Good” status along with elevated WHPT scores.

As dead fish and invertebrates were found upstream of the [REDACTED] Tributary confluence, the evidence shows that the source of the pollution that caused this fish kill, entered the river upstream of sites CRM 3 and CRM4.

The ecological evidence and biological results of this survey show that there is a distinct decline in both scores and status from CRM1 to CRM 2, indicating that a recent event impacted the local freshwater invertebrate community between these sites. Although large amounts of organic material were noted at CRM2, CRM3 and CRM4, the pollution plume did not cause a severe impact on the wider invertebrate community of the Upper Crumlin River.

5. Conclusion

A large volume of biodegradable organic matter appears to have recently entered the Coopers Water between sites CRM1 and CRM2. The source of this material seems to be from a [REDACTED]. The evidence shows that it has caused an impact on the downstream invertebrate community and deposited large amounts of organic material along the river stretch. The impact of this discharge resulted in the mortality of large numbers of fish and invertebrates, causing a decline in invertebrate quality at the sites situated downstream of where it entered the waterway.

A lesser polluting discharge was found in the [REDACTED] tributary but this was not considered to be the main cause of the recorded fish and invertebrate mortalities on the 12th February 2023.

6. Recommendations

- Further investigation by the WQI is needed to locate the source of the highly turbid water coming from the small tributary.

- Remedial action should be taken to prevent further discharge from the



Appendix 1

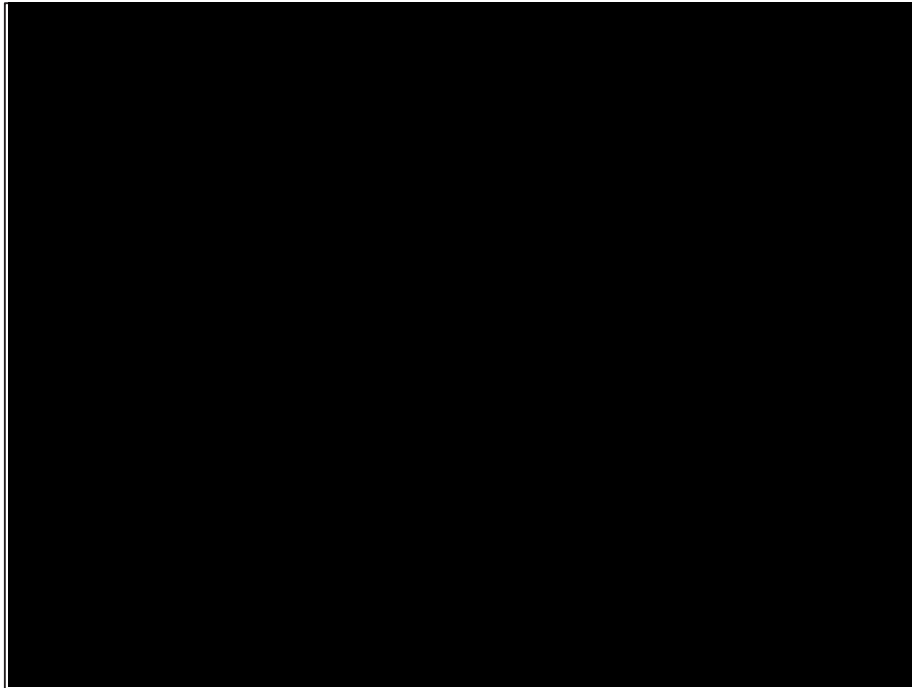


Photo 1 – Looking upstream from CRM 1



Photo 2 – Looking downstream from CRM 1. [REDACTED] is out of frame to the right.

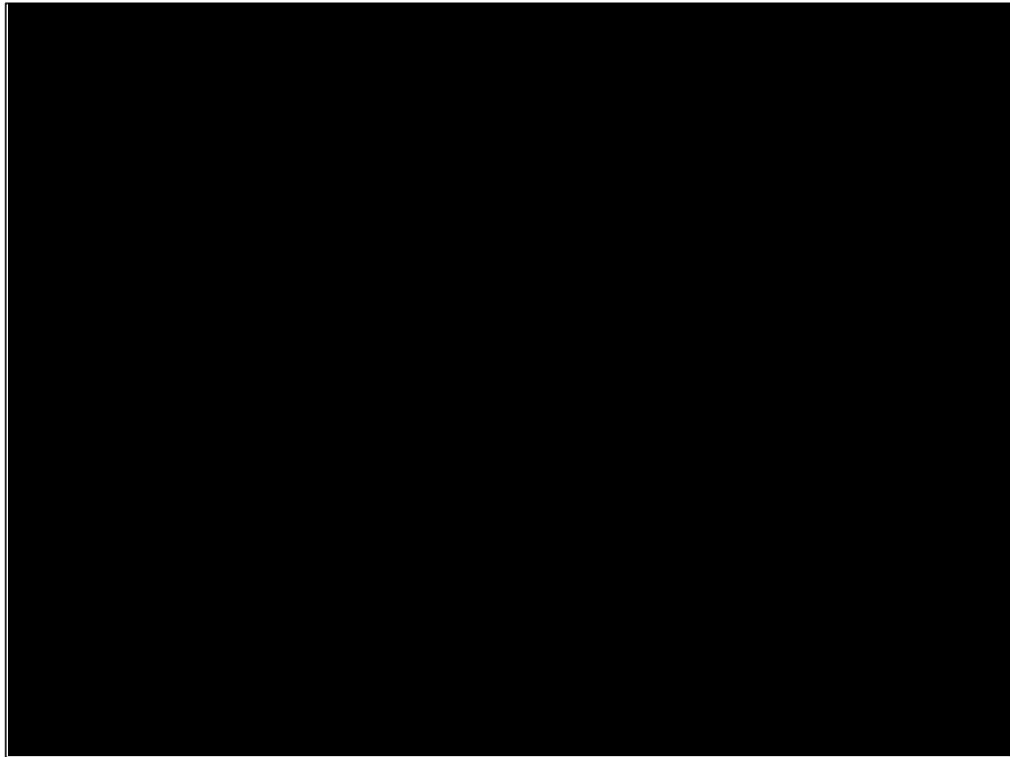


Photo 3 – Looking upstream from CRM 2

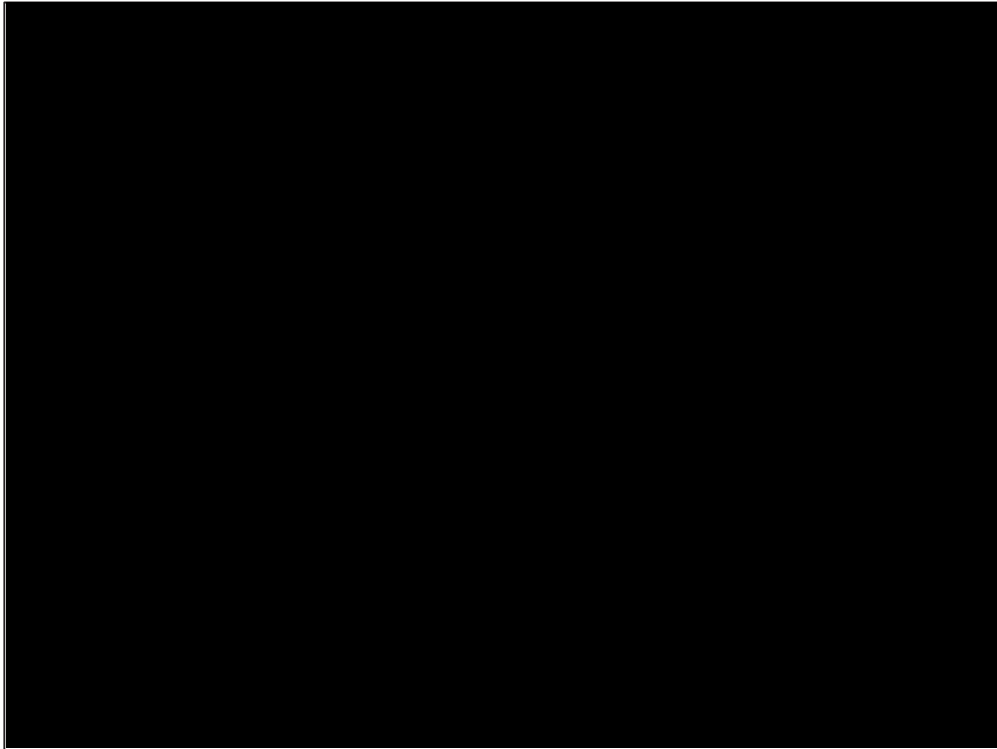


Photo 4 – Looking downstream from CRM 2

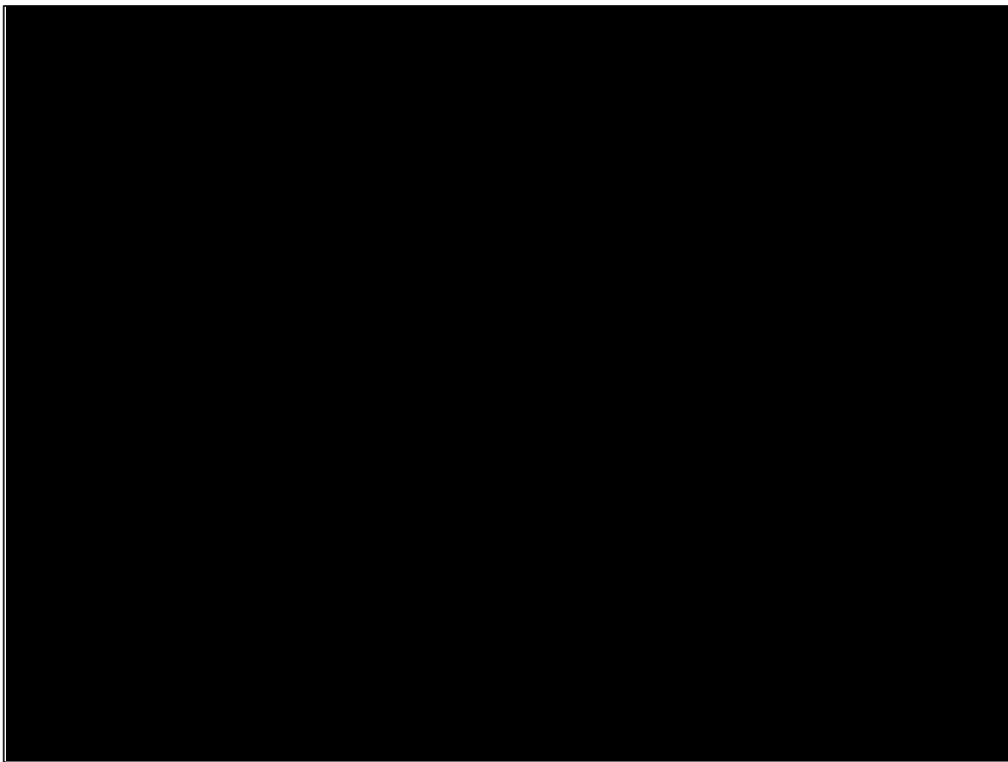


Photo 5 – Looking upstream from site CRM 3

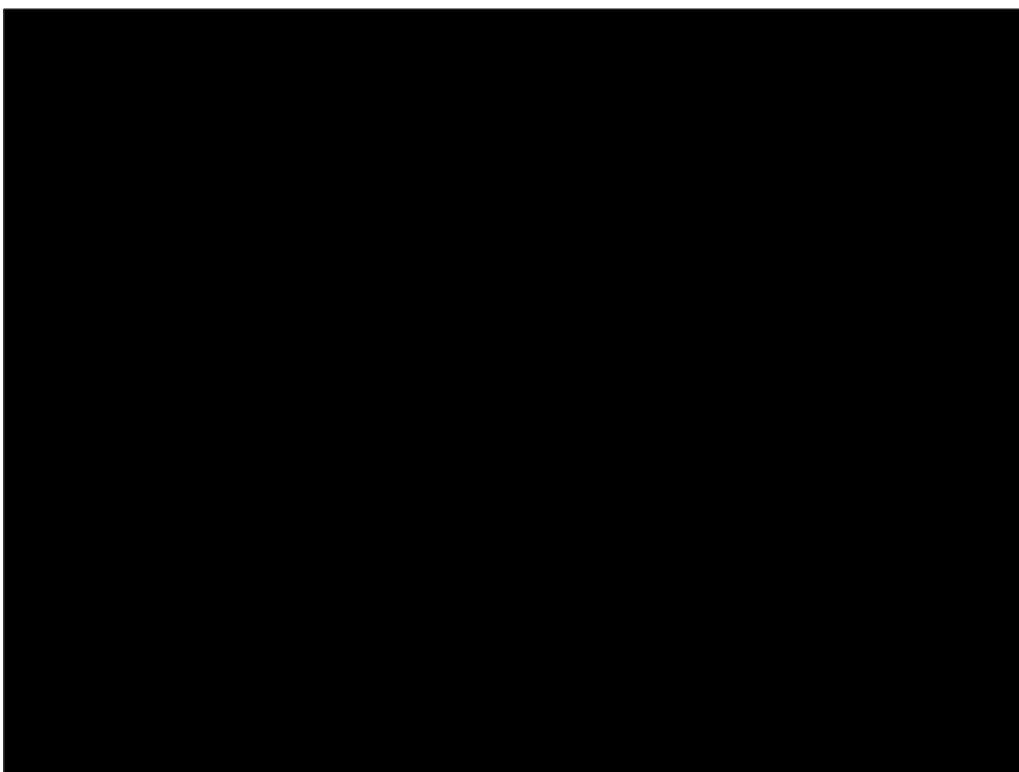


Photo 6 – Looking downstream from CRM 3. Tributary emerging from left in photo.

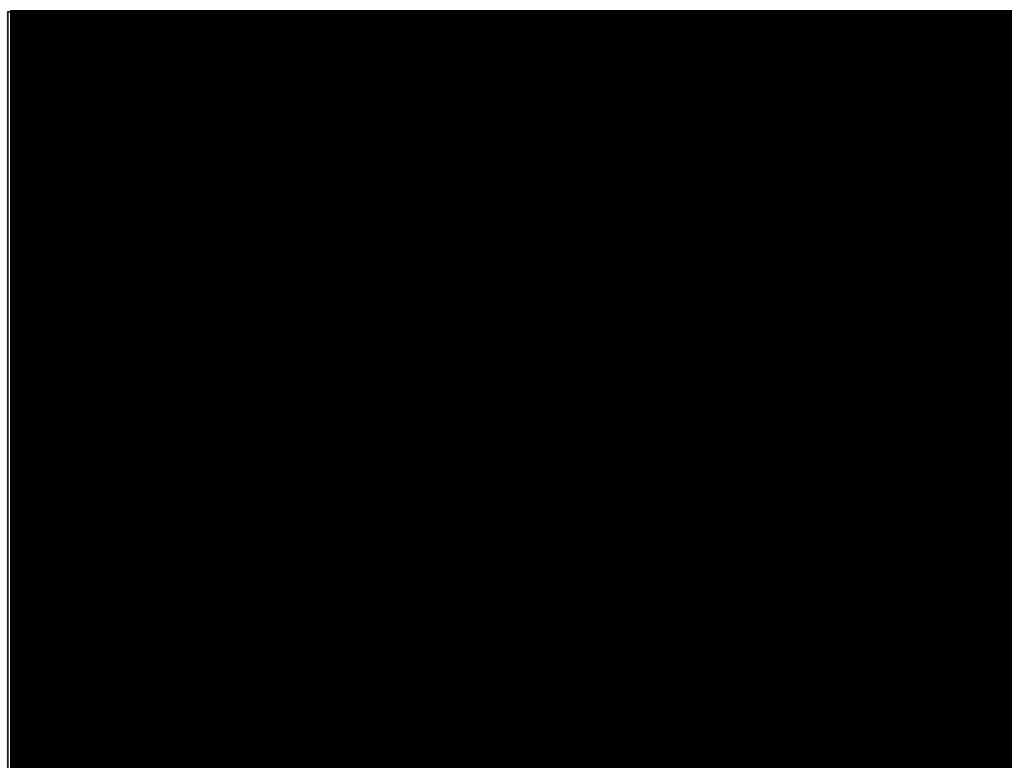


Photo 7 – Looking upstream from CRM 4



Photo 8 – Looking downstream from CRM 4



Photo 9 – Showing confluence of the [REDACTED] tributary and the Coopers Water. Heavily turbid water can be seen flowing from the tributary.

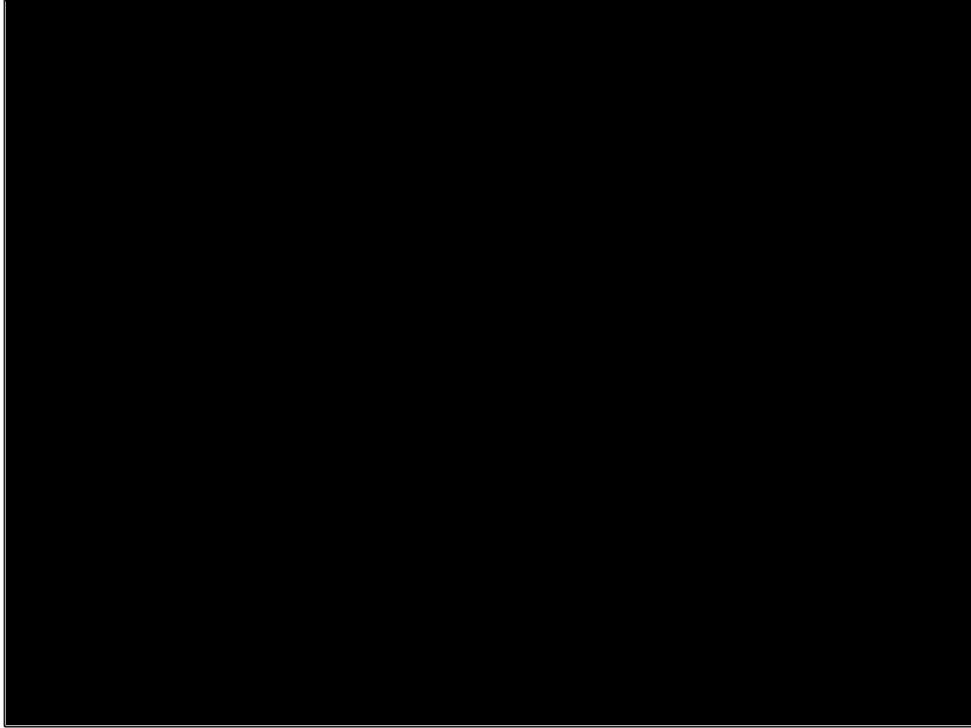


Photo 10 – View of field downstream on CRM 1 with [REDACTED]
[REDACTED] field. The wire fence is the boundary for the riverbank.



Photo 12 – Examples of the organic material noted on the substrate