UPSTREAM THINKING IN ACTION: THE RIVER FOWEY

About the catchment

Background site information

The Fowey catchment falls within the Colliford Strategic Supply Area, south-west of Bodmin Moor, in Cornwall (Figure 3). SWW abstracts water from the Lower River Fowey for potable supply, with water being fed directly to the water treatment works. Additionally, another abstraction is being used in the catchment (Figure 1). Catchment intervention measures are being delivered by West Country Rivers Trust.

Catchment Challenges

The River Fowey is at risk for pesticides, in particular MCPA and Mecoprop, both used for broadleaf weeds control, and for metaldehyde, a common pesticide against slugs and snails.

Catchment Activities

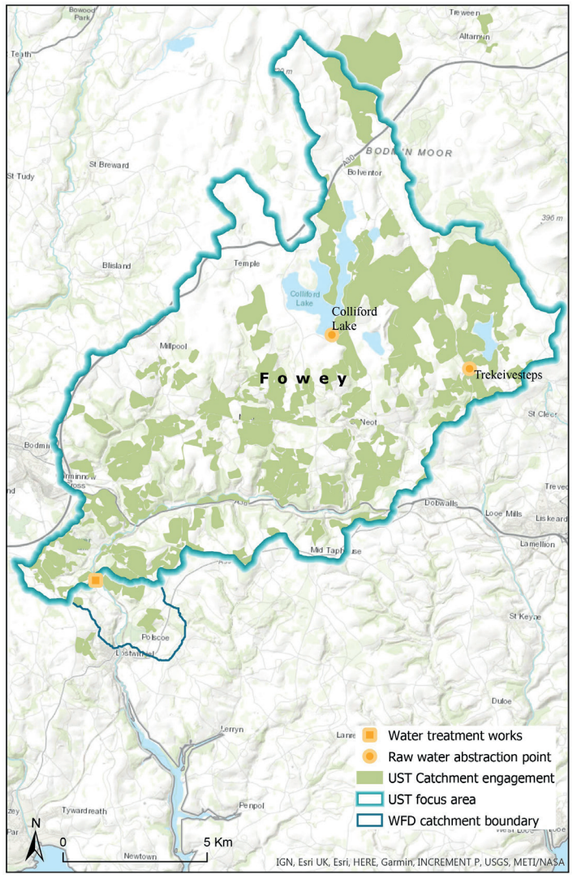
Catchment activities delivered through Upstream Thinking 2 have mostly focused on capital grants, such as yard infrastructure to support livestock or dairy enterprises. There have also been pesticide amnesties and support for field trials of alternative methods.

As of May 2019, 33% of the Fowey catchment has been engaged in Upstream Thinking 2 by **Westcountry Rivers Trust** (WRT) (Figure 1), with physical activities focussing on such things as fencing off rivers to prevent livestock access, minimising the volumes of dirty water produced and management of manure. These interventions are known to reduce nitrogen and phosphorus levels in water[1].

The River Fowey at SWW's WTW; photo by Emilie Grand-Clement.

- The River Fowey is at risk for pesticides, namely MCPA, mecoprop and metaldehyde.
- Water quality monitoring has also shown a slight decrease in turbidity throughout the 2012-2013 to 2017-2018 period, all flow conditions considered; at low flow the decrease is noticeable for both turbidity and colour, which may be attributable to UsT interventions. As such change is not yet visible at high flows, it is hoped that it will be noticeable after continued engagement and further interventions are implemented in the catchment.
- Although a number of pesticides are detected along the River Fowey and at SWW assets, the he maximum concentration measured in river water (as time weighted average) are consistently below 100 ng L^{-1}, and the total concentration of all pesticides is below 500 ng L^{-1}, thereby fulfilling the Upstream Thinking objectives.
- The frequency of pesticide detections in the raw water in the lower River Fowey has not decreased significantly with time; however, the work carried out has highlighted the most problematic compounds that occur in the river water, enabling project partners to target their actions in the catchment.

Figure 1 Map of engagement by WRT as part of UsT in the Fowey catchment.



Water quality in the Fowey catchment

Long-term changes in water colour and suspended sediment pollution

When all flow is considered (Figure 2), continuous measurements at the water treatment works in the River Fowey show no significant decrease in colour between hydrological years. However, a slight decrease in turbidity (representing suspended sediment concentrations in water) is observed. More precisely, mean turbidity has been reduced from 7.5 NTU in 2012-2013 to 3.8 NTU in 2017-2018, although maximum values remain the same, with peaks reaching 150 NTU on occasion. Reduction of both colour and turbidity in water is important to reduce primary water treatment costs in drinking water.

When only low flow is considered (Figure 3), both colour and turbidity show a significant decrease between 2012-2013 and 2017-2018: mean colour values change from 15 to 12.9 Hazen, whilst mean turbidity values decrease from 5.4 to 1.4 NTU over the same period. As low flow periods often coincide with high water demand, such results are encouraging, as cleaner water abstracted in the summer months may be less costly to treat. Amongst the interventions used in the catchment, only fencing off watercourses from livestock is likely to have an impact on sediment losses and turbidity, which might explain the small decrease, but also highlights the potential to address these problems more significantly if further measures are adopted across the catchment.

Figure 2 Variations in flow (top), colour (middle) and turbidity (bottom) per hydrological year in the River Fowey between 2012-2013 and 2017-2018, all flow values considered.

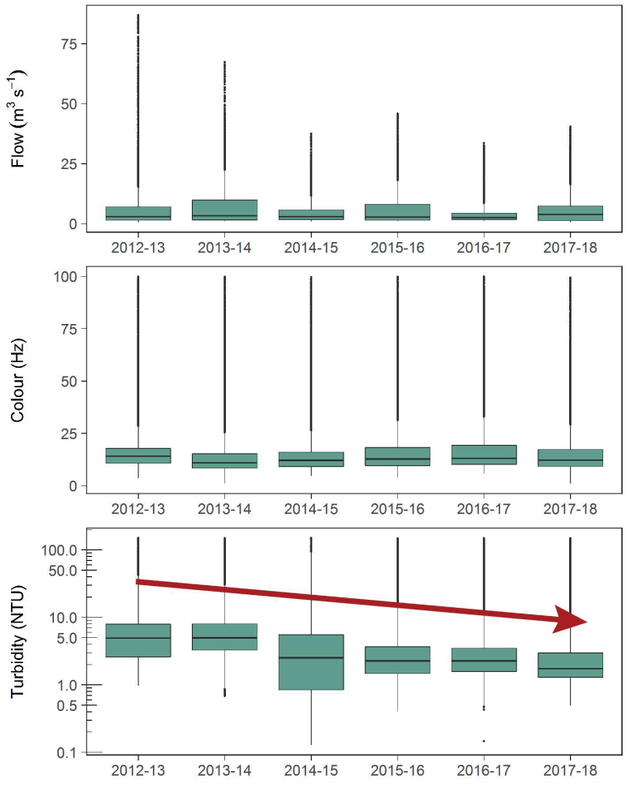


Figure 3 Low flow (≤Q70) variations (top) and corresponding values in colour (middle) and turbidity (bottom) per hydrological year in the river Fowey between 2012-2013 and 2017-2018. The red arrow shows the observed trend between 2012-2013 and 2017-2018.

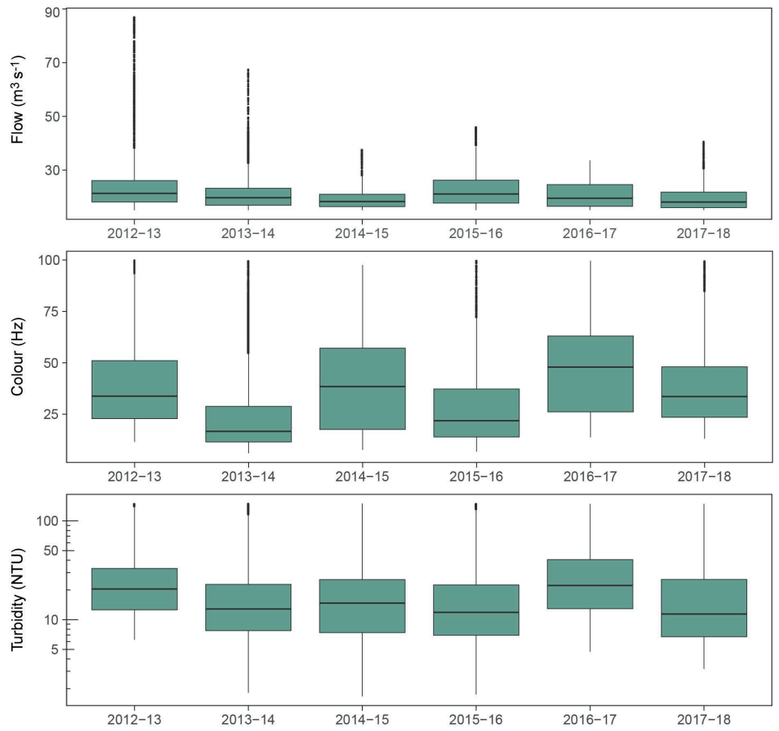


Figure 4 High flow (≥Q5) variations (top) and corresponding values in colour (middle) and turbidity (bottom) per hydrological year in the River Fowey between 2012-2013 and 2017-2018.

In the Fowey catchment; photo by Hazel Kendall (WRT).

However, such change is not observed at high flow (Figure 4), with the difference between years likely due to inter-annual variability. Moreover, high flow conditions are likely to be the most problematic periods for WTWs due to higher diffuse pollution and contaminant concentrations delivered by rainfall events. This lack of change at high flow might indicate that a more extensive range of measures is needed to affect the catchment at large scale.

Pesticide detections within the Fowey catchment

Detections in the Fowey catchment were generally low (Figure 5), with a maximum detection of 35 ng L^{-1} for 2,4-D at the Trekeive steps abstraction point (autumn 2018), and never reached either the 100 ng L^{-1} per compound or the cumulated concentration of 500 ng L^{-1} regulatory limits. Higher concentrations experienced upstream indicate a source of certain compounds higher in the catchment, and a dilution downstream closer to the WTW.

There is, however, no significant change between seasons throughout the project. In fact, the highest detections occurred in autumn 2018, highlighting the need for continued catchment interventions and pesticide amnesties in the Fowey catchment.

Stone bridge on the River Fowey; photo by Hazel Kendall (WRT).

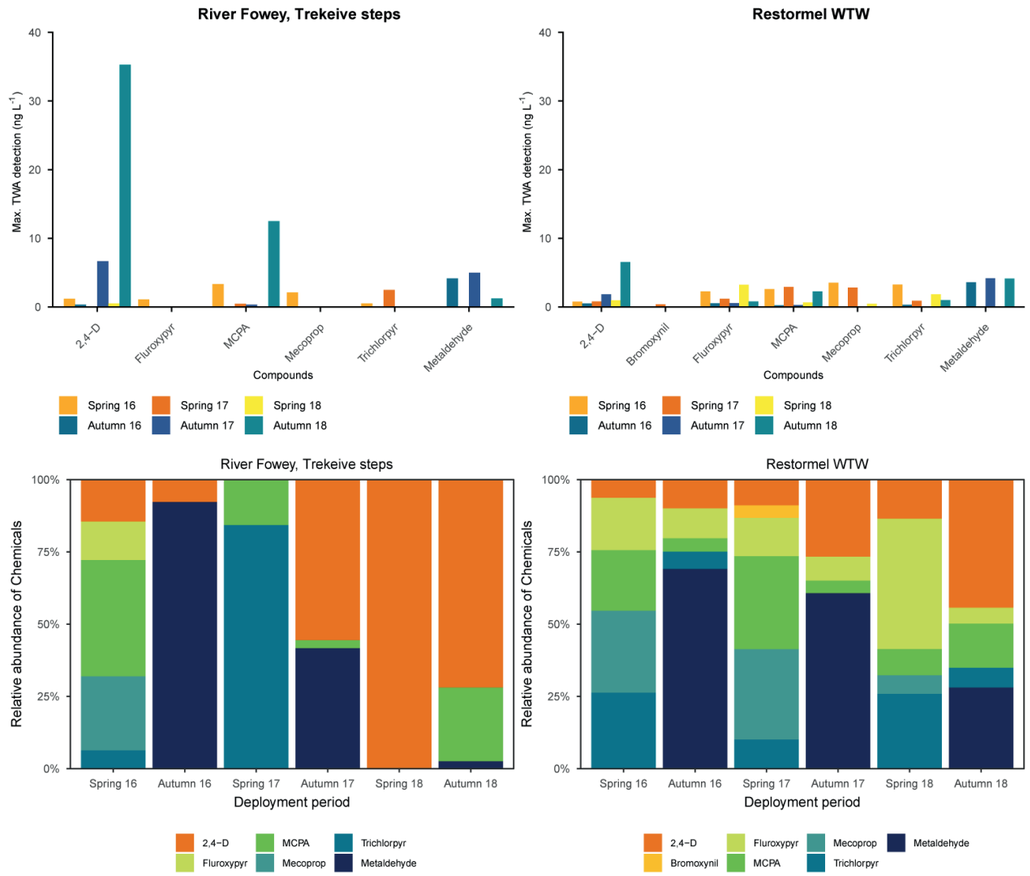


Figure 5 Maximum detections per pesticides as time weighted average between Spring 16 and Autumn 18 in the river Fowey at Trekeive steps (left) and at Restormel WTW (right) during chemcatcher deployment campaigns.

Figure 6 Relative abundance of pesticides found in the River Fowey at Trekeive steps (left) and at Restormel WTW (right) during Chemcatcher deployment campaigns.

Most pesticides in the Fowey catchment are present consistently across most deployment periods and on both locations, such as for example 2,4-D or metaldehyde (in autumn deployments only) as shown on Figure 6. This is a useful assessment of the range of compounds to target in the catchment. For example, MCPA, which had been identified as a particularly problematic compound by the EA between 2009 and 2013, is still detected regularly at the water treatment works, but at low concentrations, whilst Mecoprop (identified as another problematic compound) is being detected during all spring deployments.

Most of the pesticides detected at Restormel WTW are also found upstream at Trekeive steps, however their respective proportions vary between deployment periods. Only Bromoxynil is solely found at the WTW, albeit in low concentrations, indicating an intermediate source between Trekeive steps and Restormel WTW.

The Fowey catchment: a patchwork of woodland, intensive grassland and arable land use; photo by Emilie Grand-Clement.

REFERENCES

1. Cuttle, S.P., *et al.* (2016). A method-centric 'User Manual' for the mitigation of diffuse water pollution from agriculture. *Soil Use and Management*, 32, 162-171.