Tamar DTC Sub-catchments Water Quality: 2012 summary

The Tamar DTC sub-catchments, satellite sub-catchments to the Hampshire Avon DTC, are underlain by mudstone and sandstone. The Tamar drains through a lowland landscape dominated by intensive mixed livestock farming. Pollution mitigation in the sub-catchments is being funded by South West Water via a Payment for Ecosystem Services (PES) scheme, implemented by the Westcountry Rivers Trust.

River Tamar
Demonstration Test Catchment
Associate Partner

The hydro-chemistry of the Tamar sub-catchments was monitored on the River Neet and Caudworthy Water during 2012. These data provide the baseline assessment of current water quality before pollution mitigation strategies are implemented in the manipulated sub-catchment (figure 1). Rainfall and runoff over the monitored period are shown in figure 2. Key features of river flow during this period include:

- A dry spring in 2012 was followed by a very wet summer and autumn, resulting in 70% of the monitored rainfall for 2012 occurring in these latter seasons.
- This caused ~50 storm flow events compared with only ~30 in the preceding winter (2011) and spring (2012) months (figure 2).
- As a result the majority of the nitrate-N, total phosphorus and sediment was transported during the autumn (figure 3).
- Total phosphorus and sediment are of particular concern in these sub-catchments due to their high damage costs (figure 3).

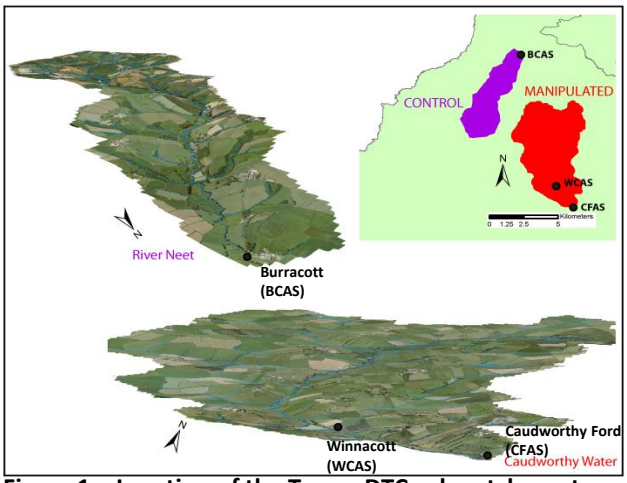


Figure 1: Location of the Tamar DTC sub-catchments. Black dots show sampling stations.

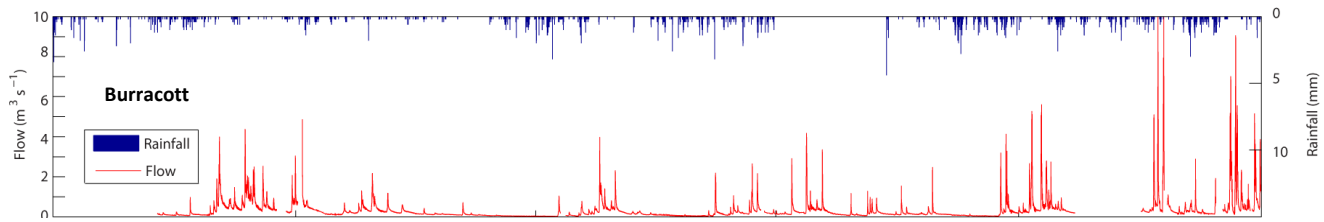


Figure 2: Plots showing example rainfall and discharge data for the Burracott site during the monitoring period in 2012.

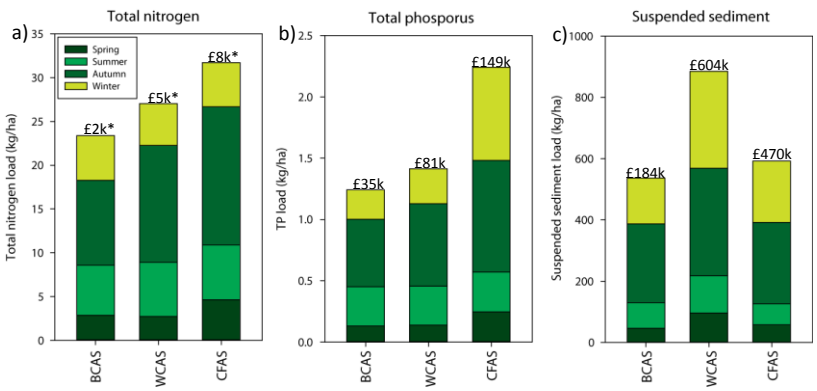
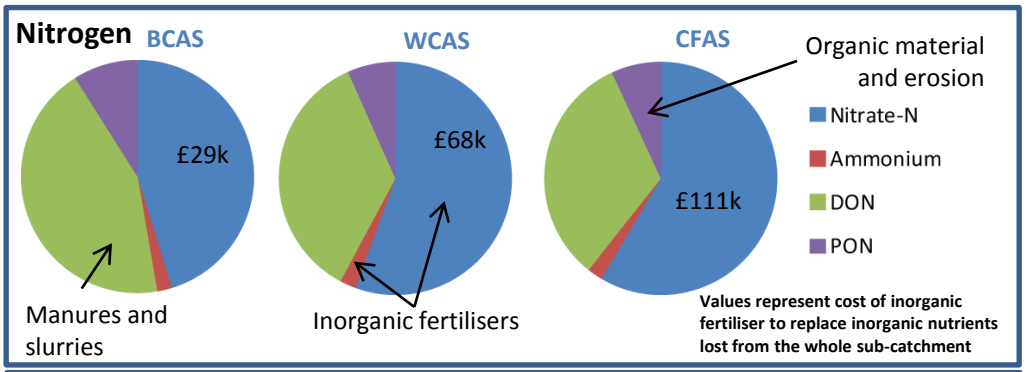


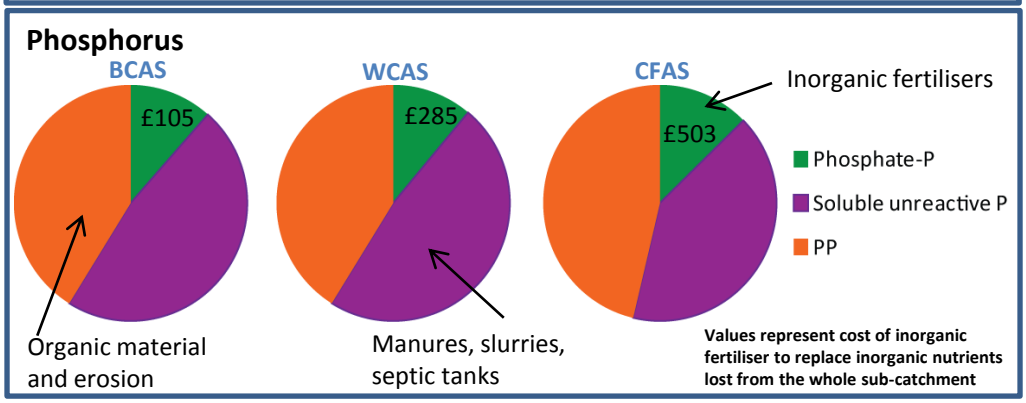
Figure 3: Seasonal comparison of the measured load of a) total nitrogen, b) total phosphorus and c) suspended sediment. Costs show total damage costs for nutrient losses from the whole sub-catchment based on impact on drinking and bathing water quality and biodiversity loss.
*** costs for nitrate fraction only.**

- Caudworthy Ford has the highest N damage cost in the Tamar DTC caused by inorganic-N in the form of nitrate.
- The majority of the total phosphorus loss to the rivers occurred during the autumn and winter months, resulting in damage costs of up to £149k.
- The highest damage costs are caused by suspended sediment; 76% of the sediment load is observed during autumn and winter. Winnacott has particularly high costs at more than £½ million.

What are the sources of the nutrients?



- Over 50% of the N at Winnacott and Caudworthy Ford is in the form of nitrate-N.
- However, dissolved organic N also contributes a large fraction of the N at all Tamar sites.



- Phosphate contributes the smallest fraction of P in the Tamar.
- The majority of the P comes from organic or sediment sources, likely to be from manures, slurries and erosion of fields, road verges and river banks.

Figure 4: Pie charts showing the fractionation of the nitrogen and phosphorus and the potential sources.

When is pollution transported?

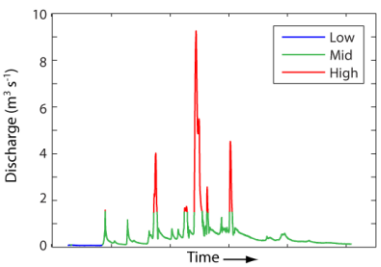


Figure 5: Example of time series showing flow, where low represents lowest 10% of flow duration record and high the top 10% of the flow duration record.

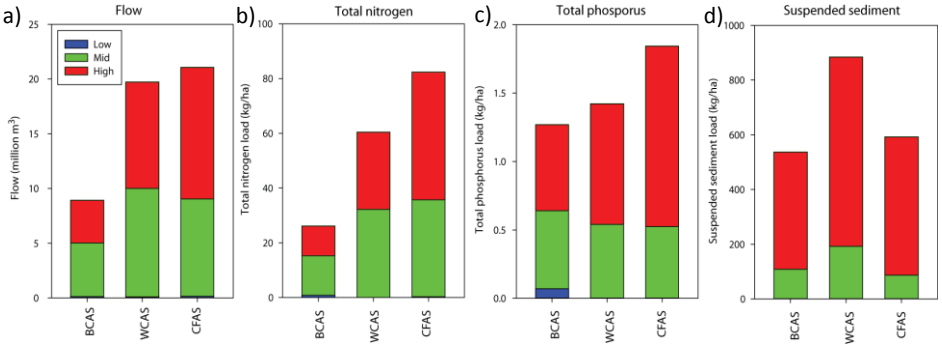


Figure 6: Bar charts showing the proportion of a) flow, b) total nitrogen c) total phosphorus and d) suspended sediment moved during low, mid and high flows.

Key messages

- Nitrate-N and organic inputs are important N fractions in the Tamar sub-catchments.
- Most of the nitrate-N is transported during mid-flows as the high-flow events tend to have a dilution effect.
- High inorganic fertiliser costs if these nutrients were to be replaced artificially.
- Organic and particulate sources are important P fractions.
- High flow events are particularly important for the transport of phosphorus and sediment into the river system resulting in large damage costs.

- High flows occurring 10% of the time contribute a significant proportion of the flow and nutrients.
- Over 80% of the sediment is transported during high flow events across all of the Tamar DTC sub-catchments.
- Between 0.6 and 1.3 kg/ha of total phosphorus is mobilised during storm events.

Figure 7: High flow events with sediment-laden water.