APPENDICES

Devon sunset; photo by DWT.

Maize compaction; photo by DWT.

Sheep farming in Devon; photo by DWT.

Caveats to modelling work

The results from the modelling work reflect an estimated change in the load on a number of parameters using interventions that could be quantified in the Farmscoper software. The following specific caveats apply which may have led to an underestimation of water quality change:

- Some interventions could not be classified for use in Farmscoper as the descriptions were too vague, or if the interventions were for ecological applications rather than water quality
- SimplyP calculates the change in dissolved soil phosphorus (P) based on the ratio of the natural soil P and the agricultural soil P, however sometimes the agricultural soil P is lower than natural soil P which causes the model to fail. As a result, soil P for agricultural and natural land was assumed to be equal to the mean agricultural and natural soil P for all UST catchments
- Applying the effect of interventions for P to SimplyP was complicated in that the actual mechanism wasn't always accounted for in SimplyP (e.g. incidental losses). The effect of interventions had to be applied to the sediment loss factor for interventions that affected erosion processes and applied to the agricultural inputs of P factor for all other interventions.
- For SPARROW, annual loads were calculated by interpolating concentrations between sampling events using river flow as a proxy. However, flow gauges were not always in the same location as the water quality gauge, in fact sometimes the distance between these two types of gauges was quite large. This has implications as to the accuracy of the annual load estimates. However, given that the temporal resolution is daily, it is likely that the actual shape of the flow hydrograph at the water quality gauge would be similar to that of the estimated flow.
- Precipitation for SimplyP was obtained from rainfall radar data, which has been shown to differ from observations, particularly in small catchments. However, this data is the best available.
- For DOC, it wasn't possible to converge on a parameter for degradation with reservoirs, this is likely because there wasn't sufficient water quality data for DOC. As a result the effect of reservoirs wasn't accounted for within the DOC model.
- The effect of reservoirs is also not accounted for in the SimplyP model; however this was determined to be insignificant during tests within the model. This is likely to be because of the relatively small area impounded by the reservoirs in UST catchments.
- For SimplyP, river slope was required, which was calculated from elevation data. However, the elevation data is rounded to the nearest metre, which has implications for the calculation of slope on relatively short stretches of river and/or flat areas.

Abbreviations

AMP6
Asset Management Planning, phase 6 (i.e. 2015-2020)

CWT
Cornwall Wildlife Trust

DOC
Dissolved Organic Carbon

DWT
Devon Wildlife Trust

EA
Environment Agency

ENPA
Exmoor National Park Authority

FWAG
Farming and Wildlife Advisory Group

HotE
Headwaters of the Exe project

MIB
2-Methylisoborneol

NH_4
Ammonium

NTU
Nephelometric Turbidity Unit

SRP
Soluble Reactive Phosphorus

SWW
South West Water

TN
Total Nitrogen

TON
Total Oxidised Nitrogen

TP
Total Phosphorus

UoE
The University of Exeter

UsT
Upstream Thinking

WFD
Water Framework Directive

WRT
Westcountry Rivers Trust

WTW
Water Treatment Works

APPENDICES

Sheep farming in the South West; photo by DWT.

River fencing; photo by Martin Ross, SWW.

Definitions and concepts

Catchment

Area defined as receiving rainfall flowing into a specific water body. In the context of Upstream Thinking, catchment boundaries also define the area of intervention by project partners around a water body (river or reservoir) of interest.

Contaminant loading

Loads are the physical mass of contaminant carried by a water body at any given time. They are calculated by multiplying concentration (usually expressed in mg L^{-1}) by the volume of water.

Eutrophication

This process occurs when a water body is overly enriched in nutrients (i.e. forms of nitrogen and phosphorus) generally originating from overland runoff. Excess nutrients leads to an overgrowth of phytoplankton (e.g. algae and diatoms), and depletion of oxygen in the water. This process changes the dynamic of the reservoir and has harmful consequences on aquatic life and the production of drinking water.

Farm plan

Document established by a farm advisor that contains recommendations and costed actions which, if implemented, could improve land management, soil heath and therefore, water quality.

Farmscoper

Decision support tool that can be used to assess diffuse agricultural pollutant loads on a farm and quantify the impacts of farm mitigation methods on these pollutants.

Feeder stream

Stream or tributary providing an inflow of water to a reservoir or a water body.

Flow duration curve

Flow duration curves are used in hydrology to understand the occurrence of various types of flow over a given timescale. They are built by ordering recorded flow values by order of magnitude and subdividing them according to the percentages of time during which specific flows are equalled or exceeded in a given period. Examples of a flow duration curve can be found on Figure 9 p18.

High flow

Period of elevated flow in water body in response to rainfall.

Hydrological year

A hydrological definition of a period of 12 months starting on the 1st October and ending on the 30th September that coincides with the natural progression of hydrologic seasons: in the UK, the hydrological years starts with the early winter rain and increasing river flows, then covers any snow and snowmelt. Rain and river flows typically decrease moving into the spring and summer months. The year ends with the period covering the lowest river flows, but some intense storms, in summer (July, August and September).

Low flow

Flow of water corresponding to dry period or droughts.

Rainfall event

Contained period of continuous rainfall causing overland flow in the catchment, and resulting in a rise and decrease of level in the receiving water body. Rainfall events are critical times for water quality, as overland flow will wash contaminants down from the catchment, leading to increased diffuse pollution.

River flow

Discharge of water in a stream or river expressed in cubic meter per second.

SPARROW

Statistical water quality model used to estimate the annual load of any contaminant from point and diffuse catchment sources; in the present work, it was applied to model and map DOC and nitrate loadings in UsT catchments.

SimplyP

Process based water quality model used in UsT to estimate the concentration and load of suspended sediment, total phosphorus and soluble reactive phosphorus.

Soluble Reactive Phosphorus (SRP)

Phosphorus can exist in many forms; SRP is a measure of orthophosphate, which corresponds to the inorganic soluble P fraction that can be used by plants.

Time series

Dataset comprising a series of data points (i.e. measurements) indexed or plotted in time order, usually taken at equal time interval.

Time weighted average (TWA)

Concentration of compound define as an average over a period of time. Such calculation is particularly used in passive sampling for pesticides where the absorbance of the compounds to the receiving disk changes with time. TWA typically provide a good view of the typical concentrations but hides potential troughs or spikes in contaminants concentrations.

Total Phosphorus (TP)

Measure of all forms of phosphorus that can be present in water, i.e. dissolved and particulate.