Assessing the impact of farm management practices on stream FIO loads using an evidence based approach

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Introduction of a revised European Union (EU) Bathing Waters Directive this year with more stringent standards, coupled with the implementation of the EU Water Framework Directive by 2015 is seeing the issues of bathing, surface and ground water quality being brought to the fore. While improvements in designated bathing waters meeting with mandatory bathing water quality regulation have been recorded because of tighter controls on point sources such as sewage treatment plants, non-compliance can still occur at designated bathing sites, which has been attributed, in part, to diffuse sources contributed from agricultural land. Research suggests that this is due to the mobilisation, transfer and successful delivery of microbes from land to water following the recycling of livestock manures to that land and from faeces deposited directly by grazing livestock. To determine the impact of a suite of farm management practices on microbial water quality (namely faecal indicator organisms [FIOs]) we are undertaking a detailed study of 10 farms that range from small hobby farms and tenant farms through to intensive dairies, in the Taw catchment, North Devon, South West England UK.

We have developed an expert-weighted risk-indexing approach to rank field and steading risk of FIO export (using source, transfer and connectivity drivers) coupled with detailed microbiological monitoring throughout distinctly different operationally active areas of the farm to identify risky farm practices and locations. This highlights FIO 'hotspots' of the farm environment that would benefit most from mitigation strategies (Phase II of the project following baseline data collection). Data collected on manure, land and animal management via a farmer survey also contributes to the risk profiling of each farm. Crucially, we aim to integrate an additional layer into our risk indexing tool to help identify the socio-economic drivers that may dictate farmer decision making and impact on the overall risk of FIOs being exported from those farms investigated. This paper focuses on the results from two distinct farm units, highlighting the results of the detailed microbiological monitoring and the subsequent integration of this evidence-based approach into the physically-based risk tool. The development of a relative risk tool, rather than a quantitative predictive model, that can assist farmers and land owners to prioritise land that is most 'risky' in terms of contributing bacterial contamination to watercourses will help focus mitigation efforts where they are likely to be most effective in terms of improving water quality.