

AGRICULTURAL DIFFUSE POLLUTION AND BATHING WATER QUALITY: RISK IDENTIFICATION AND MITIGATION.

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Fifteen percent of Scotland's 60 identified bathing waters failed the EC Bathing Water Directive's mandatory standard in 2001. Sewage effluent from combined sewer outfalls was, by far, the main cause of polluted coastal waters. However on-going remedial action to reduce this sewage pollution may be insufficient to guarantee a mandatory pass in parts of Scotland due to diffuse pollution of faecal indicator organism (FIO) bacteria from agriculture. The objective of this study was to investigate the potential risk of FIO contamination of watercourses from farm management practices and to develop, promote and encourage best management practices (BMPs) to reduce the risk.

One hundred and sixty eight farmers and agricultural waste contractors were surveyed and a risk assessment on 157 farms was carried out in five river catchments across Scotland. Waste storage facilities, farming practices, field conditions and risks to watercourses were assessed on each farm. GIS datasets of catchment characteristics were used to scale up and model the risk assessment to catchment level. River samples at 33 locations were regularly taken and analysed for FIOs. Workshop and training courses for farmers were implemented and BMP action plans were implemented and monitored on some farms.

Forty three percent of all farmers and 75% of waste contractors were unaware of the pollution prevention advice given in the Scottish Executive "Code of Good Agricultural Practice" and as a result discharges of effluents and FIOs into watercourses were found in the majority of farms in the catchments. One major contributory factor to this was the insufficient or unsatisfactory waste storage facilities on many farms. 21% of farms had less than 1 month storage for the farm's manure production, while 71% had less than 5 months storage.

Diffuse discharges of FIOs via run-off and field drainage, particularly from areas of poorly managed slurry application and intensive grazing, was another potential source of FIO. 11% of farmers spread manures in conditions likely to result in run-off (e.g. on poorly drained or steeply sloping soils). The stream FIO data backed up these observations of pollution risks associated with some intensive livestock farms. The concentrations of FIOs in the streams of two sub-catchments of high livestock intensity were 4 to 8 times higher compared to two sub-catchments that had low livestock intensity. Subsurface drainage from a grazing field contained 8840 to 32,500 *E.coli* cfu per 100 ml.

Most potential risks to river and bathing water quality may be greatly reduced through improved manure/dirty water and grazing management, forward planning of land spreading activities and improved operational procedures. The majority of farmers could significantly reduce the risk of water pollution by FIOs through limited expenditure and good management practice.

Keywords: Agriculture, diffuse pollution, livestock, manure, rivers, catchment management