Baseline Q-values for streams in intensive agricultural catchments in Ireland

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The effectiveness of regulations introduced in Ireland in 2006 in response to the European Union Nitrates Directives for minimising nutrient loss to waterways from farms is being studied by Teagasc, the Irish Agriculture and Food Development Authority as part of an Agricultural Catchments Programme from 2008 – 2011. The regulations in Ireland require that during winter, green cover is established and maintained on arable farms, manure is stored and not spread, ploughing is not conducted and that chemical fertiliser is not spread. The regulations also require buffer zones between fields and water courses when applying organic or chemical fertilisers and that nutrient application rates and timing match crop requirements. An upper limit for livestock manure loading of 170 kg ha-1 organic N each year is also set. The biophysical research component of the Agricultural Catchments Programme is focussed on quantifying nutrient source availability, surface and subsurface transport pathways and stream chemical water quality. A baseline description of stream ecological quality was also sought.

Stream ecology was measured in autumn 2009 at 3-5 locations within four surface water catchments and at the spring emergence of a catchment underlain by karst limestone. Landuse in each catchment is dominated by medium to high intensity grassland or cereal farming and annual average rainfall ranges from 900 - 1200 mm. Surveys were conducted in 1st to 3rd order streams throughout each catchment at locations which had minimal observed point source inputs for 100m upstream, incomplete shade, a hard streambed substrate and riffle conditions suitable for the sampling methods. Benthic macroinvertebrates were identified and quantified and used to calculate the biological indices Small Stream Risk Score, Q-value, Biological Monitoring Working Party (BMWP), Average Score Per Taxa (ASPT) and EQR (Observed Q-value/Reference Q-value). Diatom community assemblages were identified from samples collected by scraping submerged cobbles and a Trophic Diatom Index and EQR were calculated. Hydromorphology of each sample location was assessed using the River Hydromorphology Assessment Technique (RHAT). Stream water chemistry (nitrate-N, total N, total phosphorus, reactive phosphorus, electrical conductivity, suspended sediments, major cations, pH) was measured at monthly intervals near each ecological survey location.

The ecology measurements will be repeated in summer and autumn 2010 to provide a baseline indication of Q-values in the catchments. A fish survey will also be conducted in 2010. The ecological surveys were conducted by the Aquatic Services Unit at University College Cork, Ireland. This paper describes the major farming and stream chemical characteristics of the five catchments and reports on results of the 2009 ecological surveys.