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P and N content of surface and subsurface water flows in limestone soil

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Key words : overland , interflow and drainage water flow nutrient content

Introduction Pathways for P & n transport from soil to water bodies include overland flow , interflow and vertical flow .While a distinction can be drawn between infiltration excess and saturation excess overland flow , in practice they can be difficult separate Likewise , interflow , which describe the lateral movement of water that has infiltrated the soil , but has not drained to groundwater , may emerge down slope and become indistinguishable from inter and overland flow .Ground water may also rise to the surface in places and merge with overland flow . Water moving by these pathways acquires nutrient by physical detachment of soil particles and by dissolution of soluble constituents .Field experiments in Ireland investigation the mobilisation of soil and fertilizer nutrients and their transport in water have usually been conducted on sites with imperfectly or poorly drained soils (Tunney et al . , 2005) .The overland flow is not significant on the well-drained soils that are most intensively farmed in Ireland . However , since infiltration is influenced by land-use that can affect soil hydraulic conductivity though compaction and structure breakdown , naturally well-drained soils may be more susceptible to overland flow than their genesis would suggest .In the work describes here simple equipment was used to operationally distinguished between overland flow , interflow and vertical flow , with frequencies of occurrence of these flows recorded and water samples representing them collected and chemically analysed for dissolved reactive P and Nitrate .

Materials and methods Collectors were installed in five stations located at 1m altitudinal intervals (71-76m OD) on N-S transect in the Hill Field (grass land) at UCD Research Farm .Overland flow was collected from miniplots hydrologically isolates using 40cm diameter PVC rings , 10cm deep , embedded to a depth of 5cm , with a connection to collected at low point of the ring . Interflow was collected in stoppered , wide mouthed plastic bottles (2000cm³) that had been at placed in holes excavated to their depth and diameter .The bottled were preformed around the top 10cm of their circumferences .Drainage water was collected by suction using Teflon soil water samplers (station 1-5) installed at varying depths .All water samples were filtered through 0 .45-µm Millipore filter immediately after collection and subsequently analysed for dissolved reactive phosphate (DRP) colorimetrically by ascopic acid ammonium Molybdate method and nitrate by ion chromatography .

Results and discussion The soil of the Hill Field grads from being a Grey Brown Podzolic at higher elevation to a Gley in its bottom side corner , with drainage transition from good to imperfect .Between November 2004 and April 2006 , overland flow was recorded and sampled on 21 occasions , while interflow was recorded on 26 occasions .Suction samples were collected , at different depths , through the monitoring .The range of values for dissolved reactive P and nitrate in the various water samples as shown in the Tables Below .

Table 1 Dissolved reactive P (Mg .ml⁻¹) .

Type of flow	Depth (cm)	Range	Mean
Overland	0	0 .14-2 .67	0 .969
Interflow	0-10	0 .00-3 .40	0 .509
	25	0 .00-0 .17	0 .015
Drainage	65	0 .00-0 .10	0 .002
	85	0 .00-0 .01	0 .002

Table 2 Nitrate concentration (Mg .ml⁻¹) .

Type of flow	Depth (cm)	Range	Mean
Overland	0	1 .4-96 .3	32
Interflow	0-10	0 .8-1215	76
	25	0 .0-1128	243
Drainage	65	0 .0-3313	238
	85	0 .0-701	167

Conclusion Episodes of overland flow and interflow occurred even though the site is located in the lowest rainfall in Ireland and the most of the field land covered by well-drained soil .Water samples of different origin showed marked differences in their dissolved reactive P and nitrate contents , where DRP relatively high in overland and interflow samples , the nitrate was high in drainage samples .

Reference

Tunney .H . , Jordan , P . , Kiely , G . , Moles , R . , Moran , G . , Byrne , P . , Menary , W and Daly , K .(2005) .Phosphorus transfer to river water from grassland catchments in Ireland XX International Grassland Congress : Offered paper .Wageningen Academic Publishers .pp \$90 .