AGRICULTURAL CATCHMENTS PROGRAMME

IPW, Uppsala, 10th September 2013

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Catchment Integrated Phosphorus Transfer Pathways within the Agricultural Landscape

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Teagasc
Agriculture and Food Development Authority

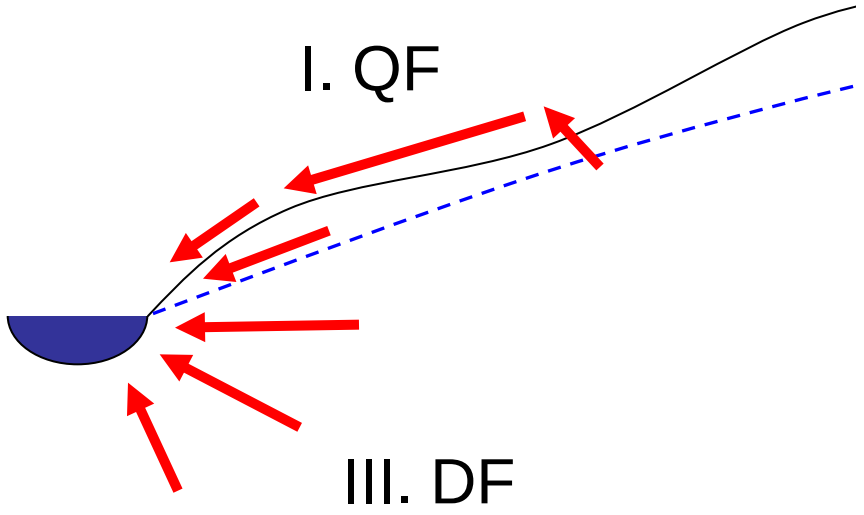
The Irish Agriculture and Food Development Authority

Conceptual Model of Nutrient Transfer Pathways

I. Quick flow
- Surface runoff
- Drains and ditches

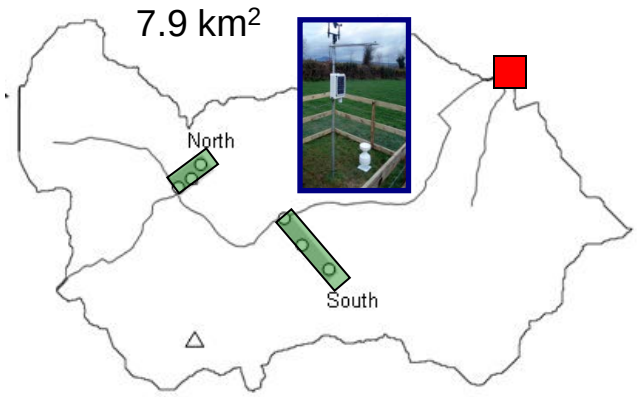
II. Interflow:
- Subsoil
- perched water

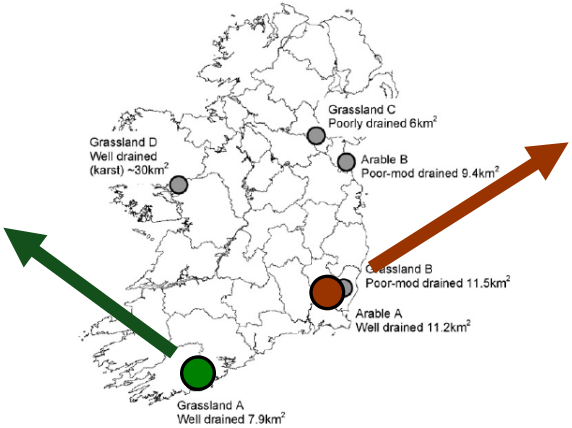
III. Delayed flow:
- weathered bedrock
- Fissures



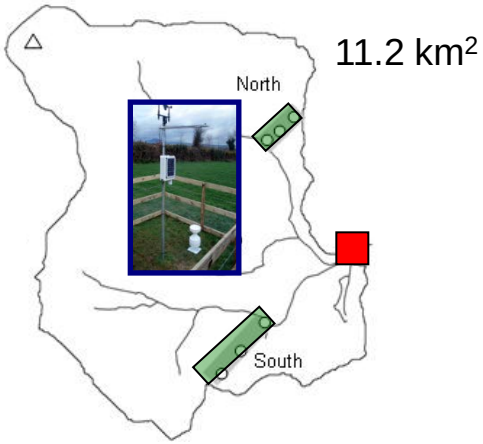
AGRICULTURAL CATCHMENTS

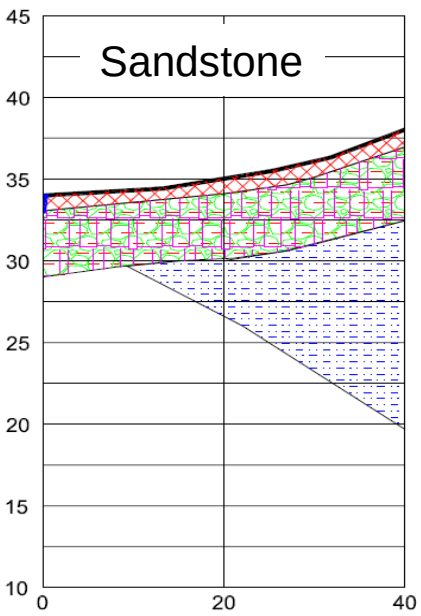
Grassland catchment

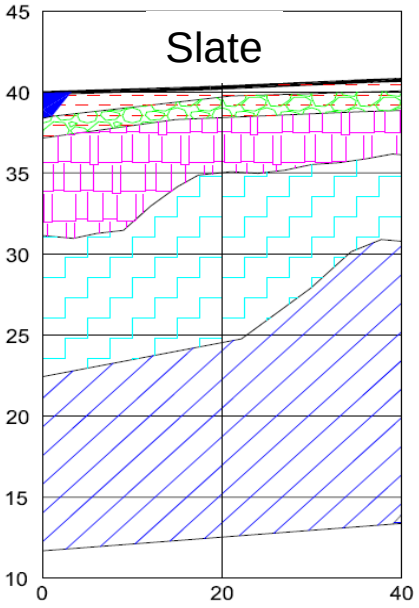




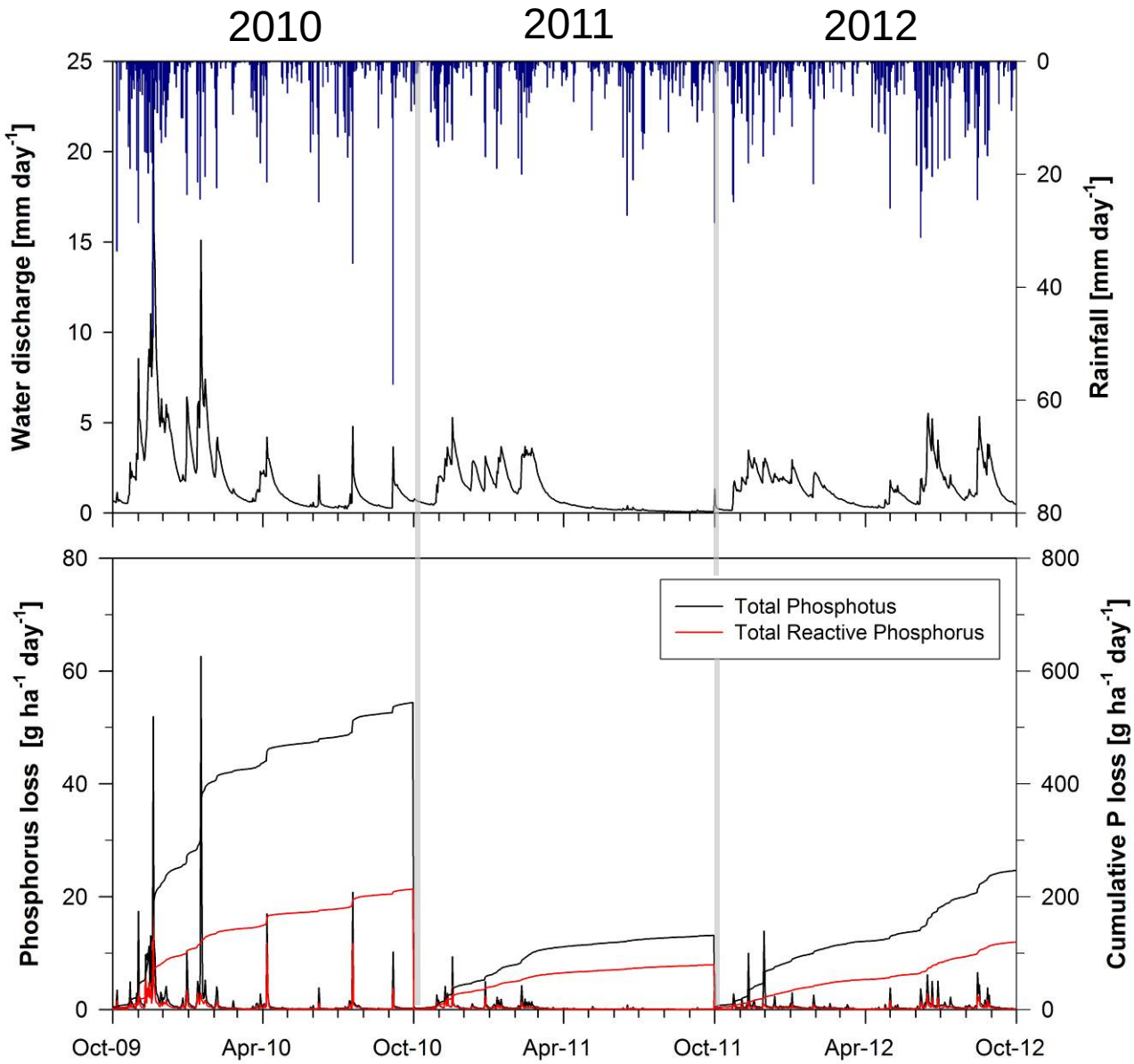
Arable catchment



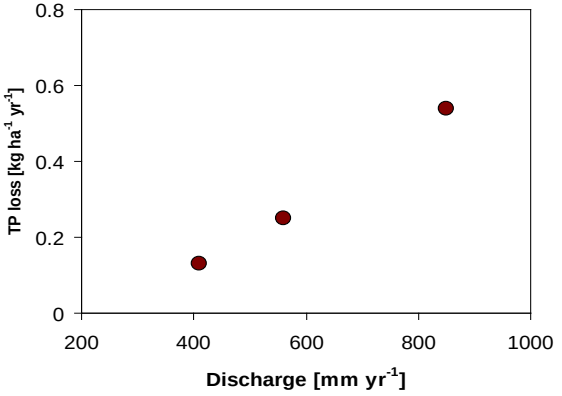




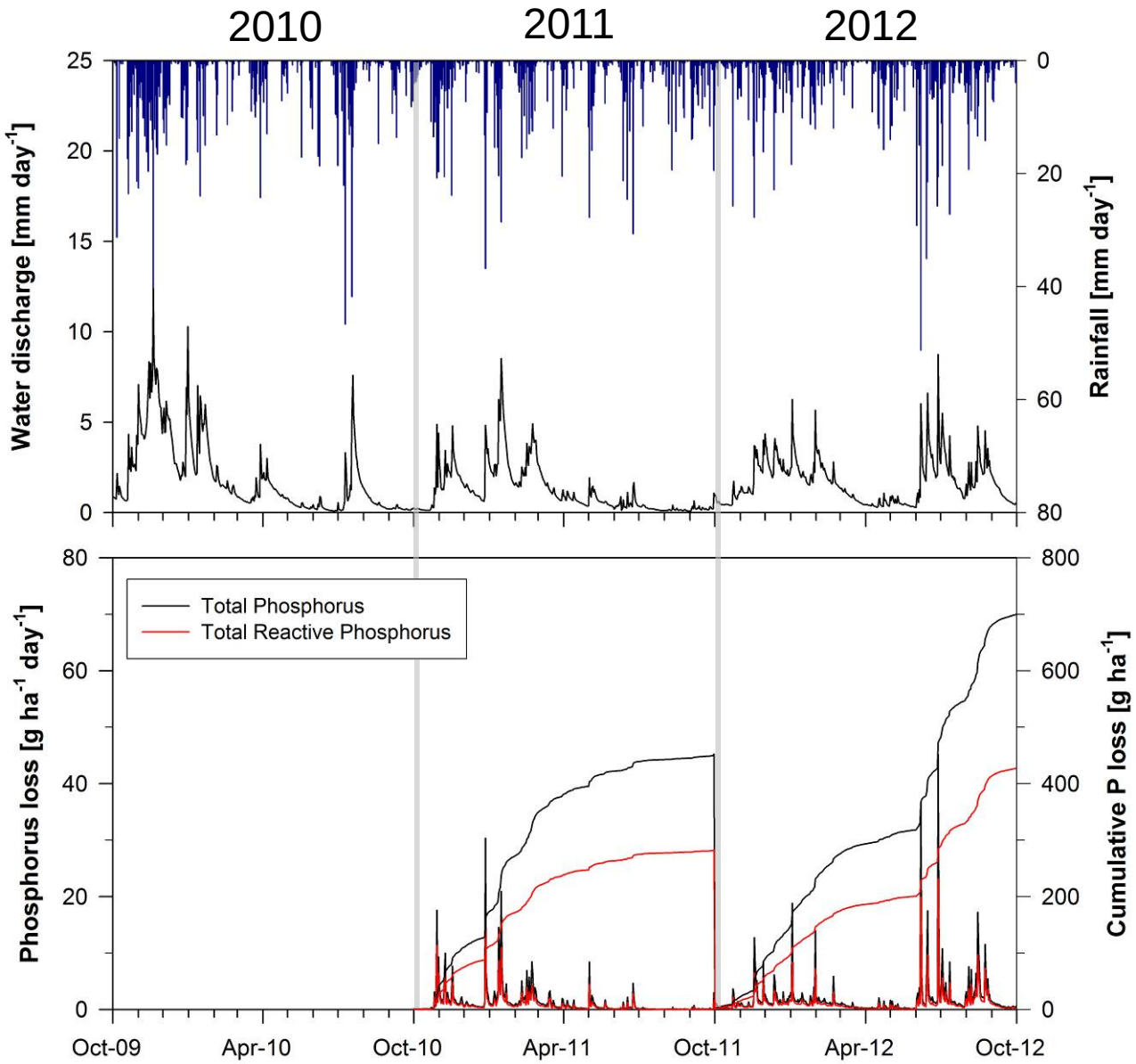
Arable



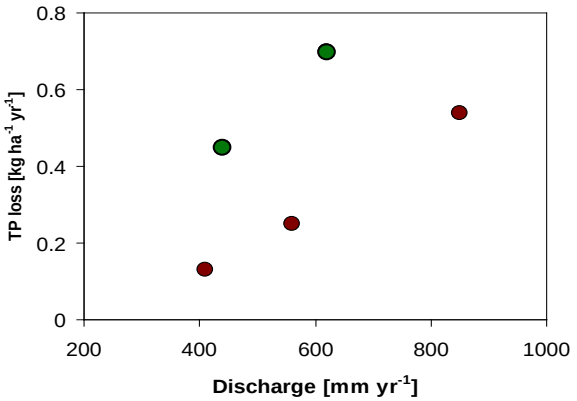
	Rain [mm]	Discharge [mm]	TP [kg ha^{-1}]
2010	1240	850	0.54
2011	780	410	0.13
2012	1110	560	0.25



Grassland

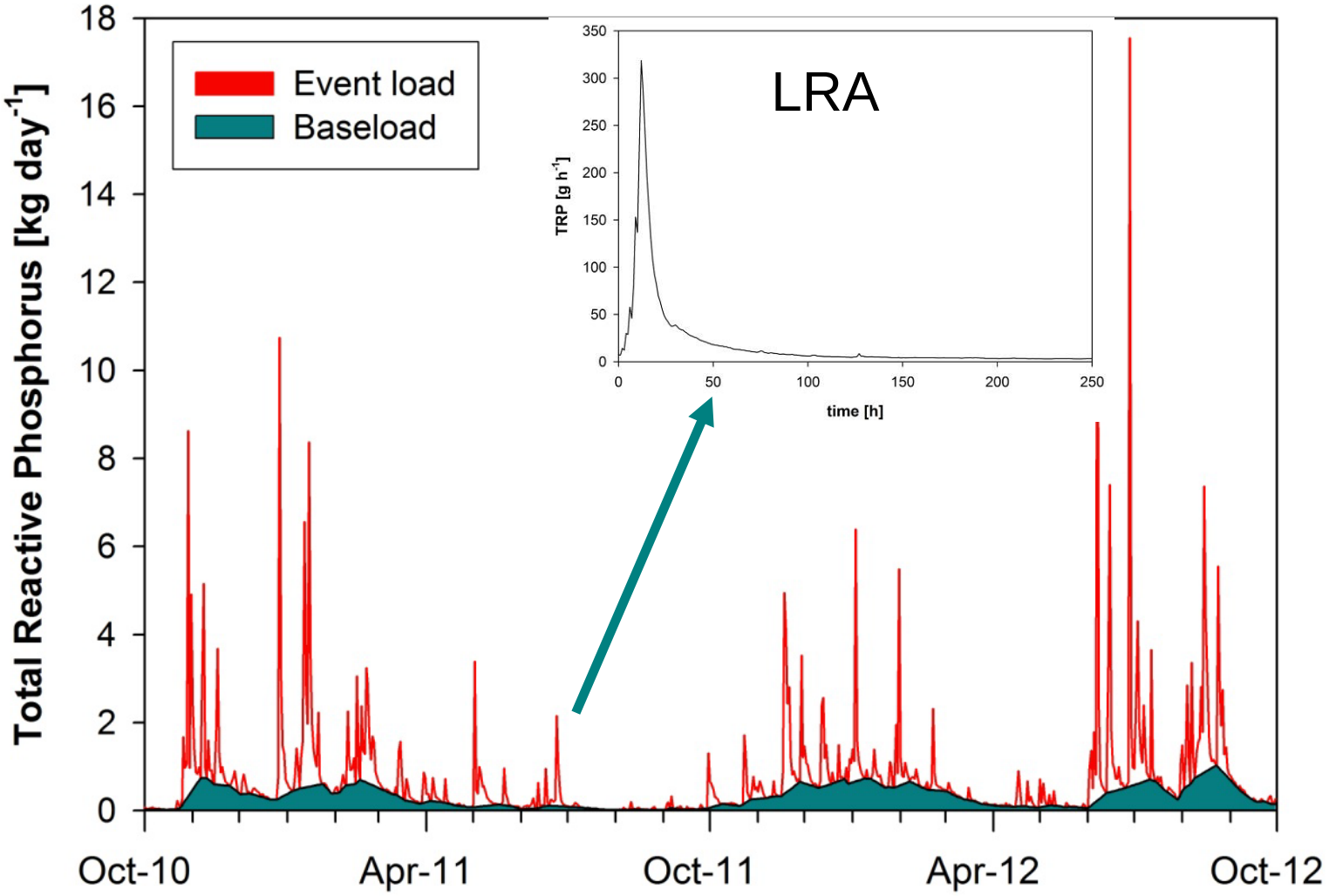


	Rain [mm]	Discharge [mm]	TP [kg ha^{-1}]
2010	1320	710	-
2011	1090	440	0.45
2012	1130	620	0.70

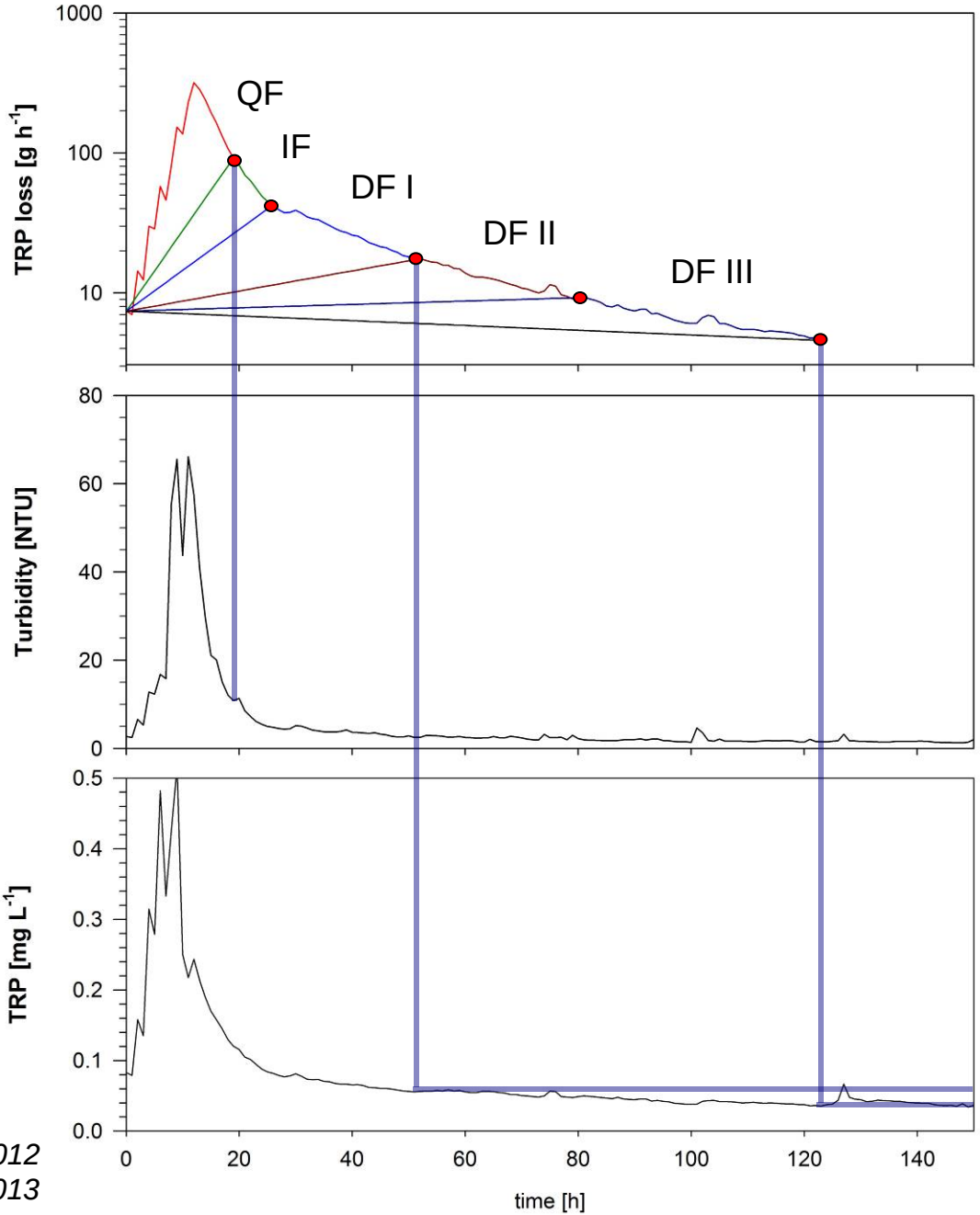


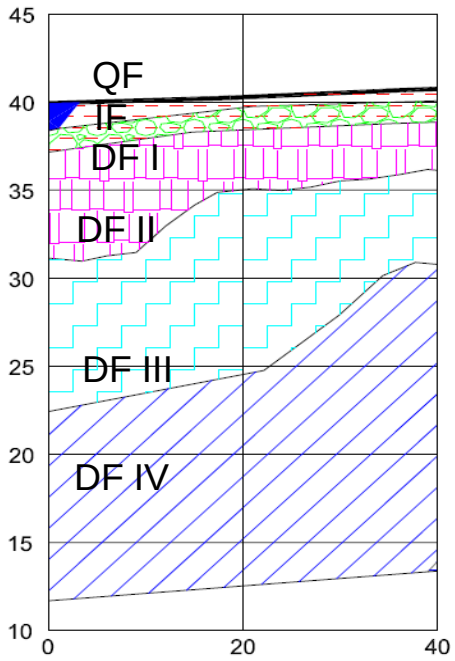
1. Base Load Separation

Grassland



2. Loadograph Recession Analysis



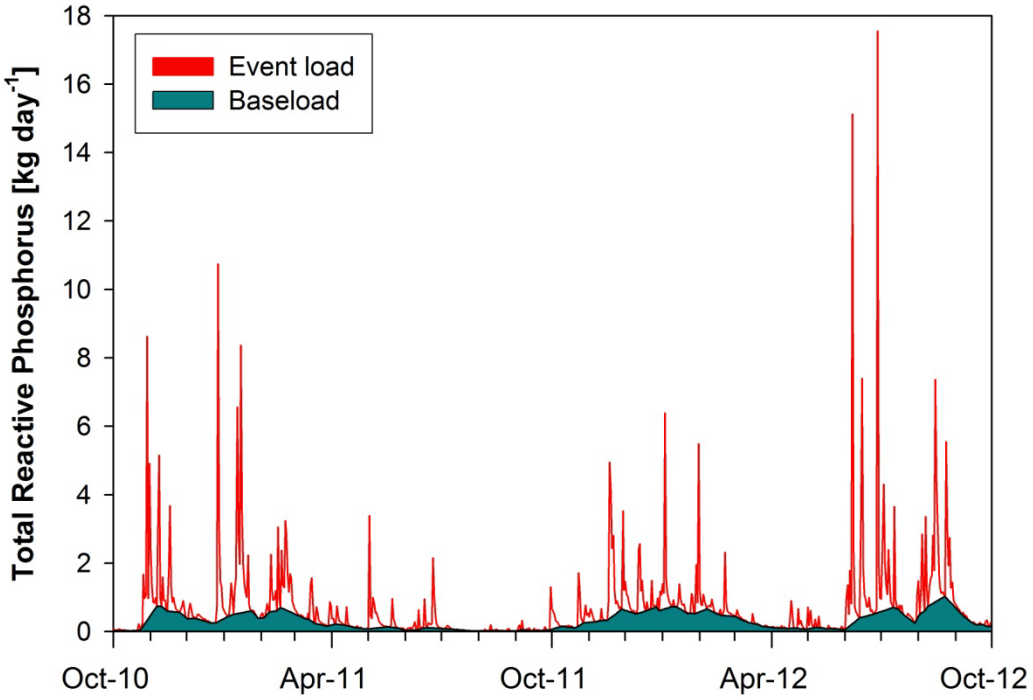


Shallow groundwater
Deep groundwater

Mellander et al., ES&P 2012
Mellander et al., ES&T 2013

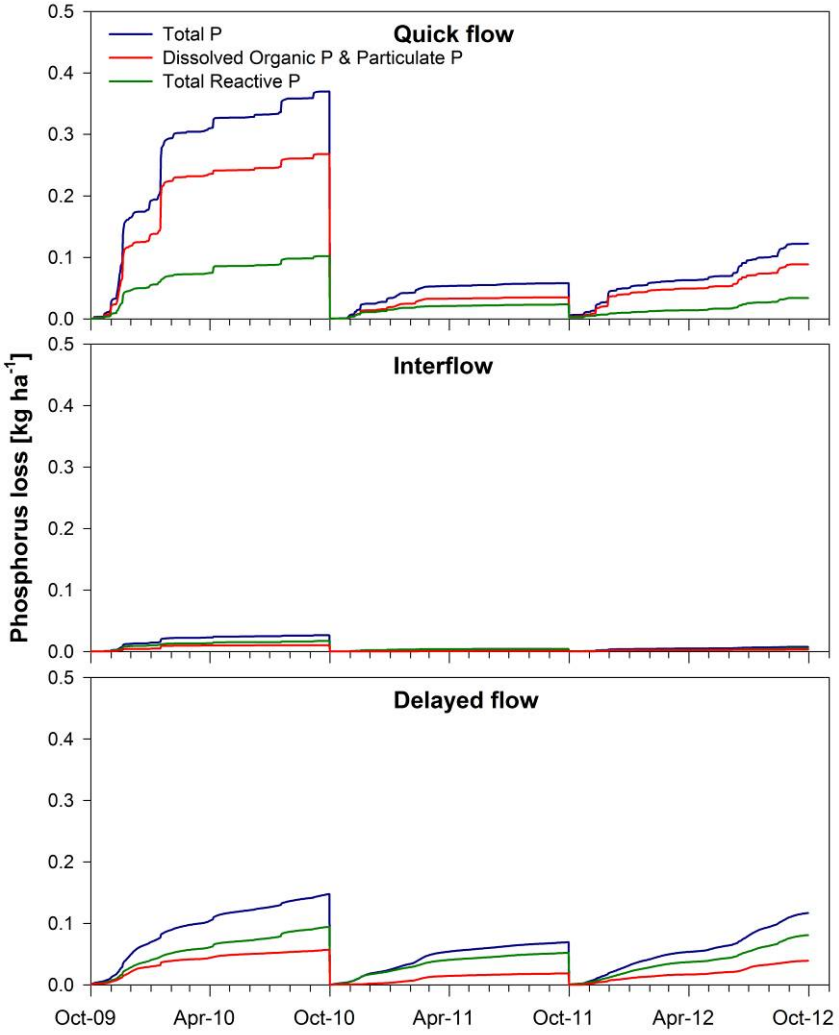
Event Transfer Pathways

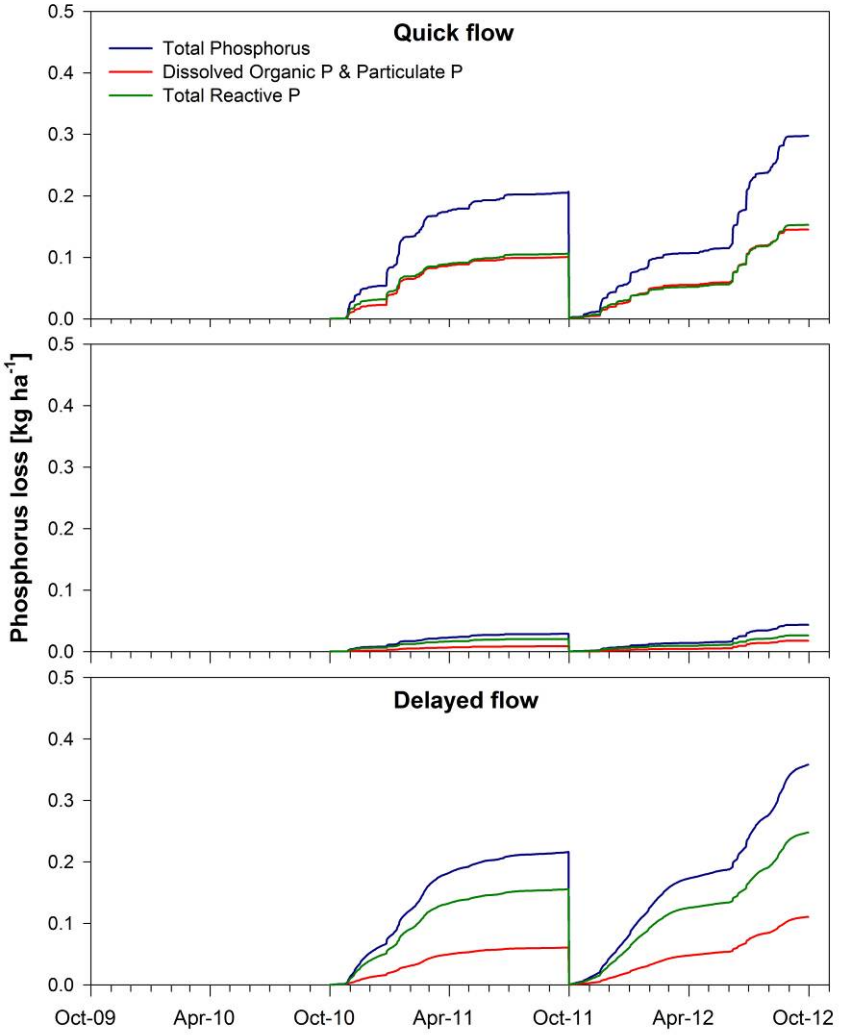
	Arable catchment			Grassland catchment		
	QF [%]	**IF [%]**	**DF [%]**	**QF [%]**	**IF [%]**	**DF [%]**
Stream water discharge	57.9	8.6	33.6	35.0	14.8	50.2
Total Phosphorus loss	84.2	5.8	10.0	69.7	11.3	19.0
Total Reactive Phosphorus loss	72.3	10.1	17.6	62.9	13.0	24.1

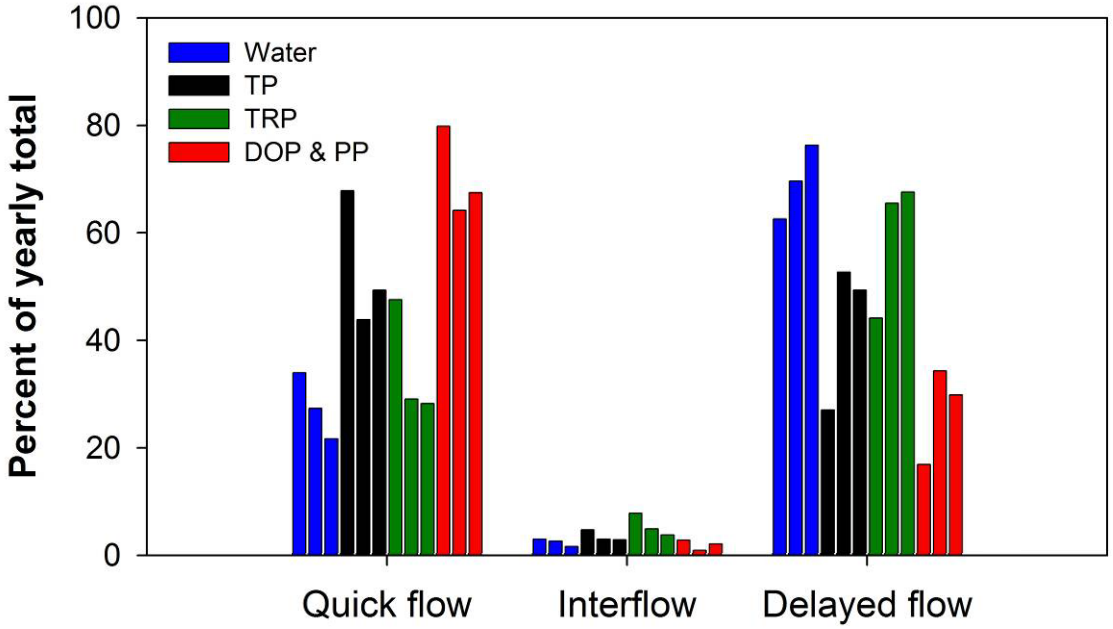


Arable catchment

Grassland catchment

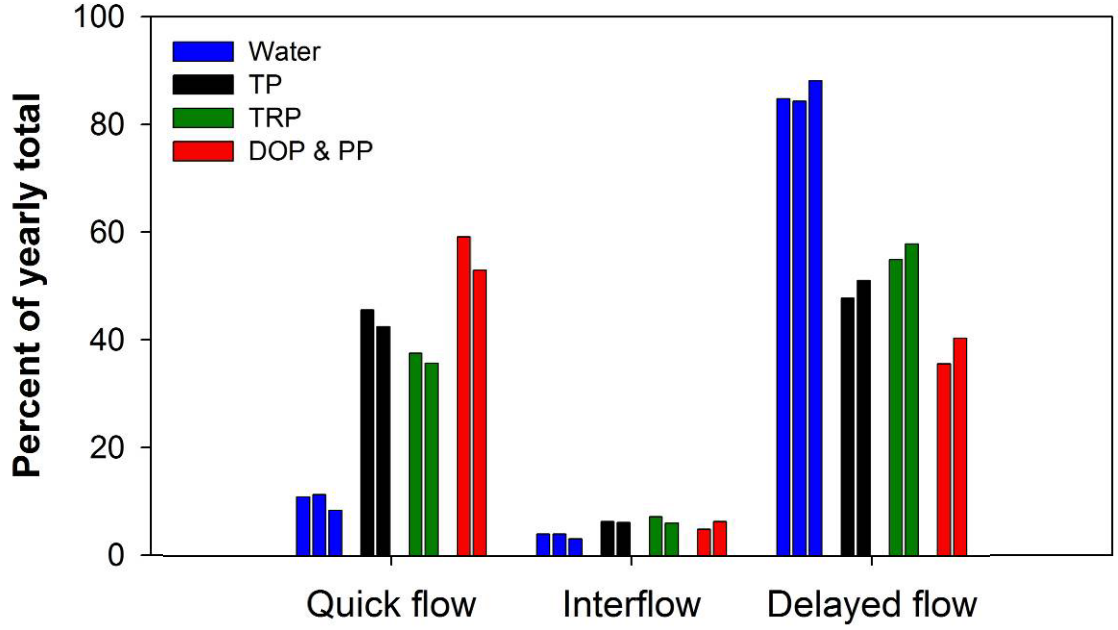






Arable catchment

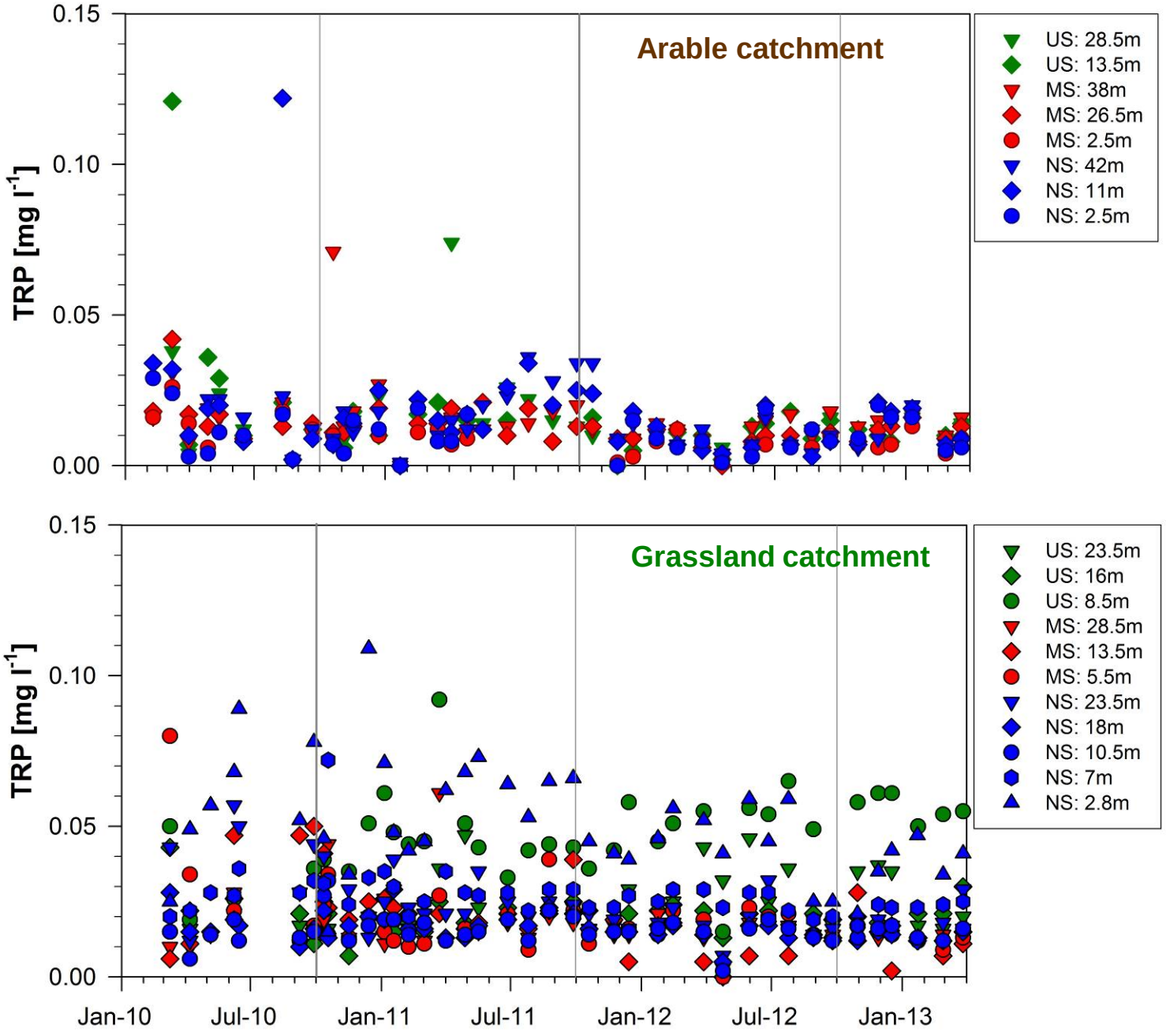
28% of discharge generated by QF
=> 54% loss of TP
70% of discharge was generated by DF
=> 42% loss of TP



Grassland catchment

10% of discharge generated by QF
=> 44% loss of TP
86% of discharge was generated by DF
=> 50% loss of TP

Phosphorus in groundwater



Conclusion

- P flux differed between the two catchments but P transfer pathways were proportionally similar
- High P conc. in groundwater and a large flow contribution (ca. 80%) caused a high P loss *via* DF transfer pathways
- Large storms increased the QF transfer pathways and the proportion of PP (more in the Arable catchment). There were high proportions of DOP in the DF transfer pathways (more in the Grassland catchment)
- Measures may need to address vertical losses of P in loading to shallow groundwater
- Measures targeted at nutrient sources may provide an effective mitigation of nutrient loss over time in soils of high permeability
- Policies such as surface placed buffer strips may only be partly effective in some catchments.

Acknowledgements

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http://www.teagasc.ie/agcatchments/

Department of Agriculture, Food and the Marine

Catchment farmers

ACP team

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