UNCERTAIN DIFFUSE PHOSPHORUS PATHWAYS IN CATCHMENTS

Per-Erik Mellander, Alice Melland, Phil Jordan, David Wall & Ger Shortle

Agricultural Catchments Programme,
Teagasc, Johnstown Castle, Wexford, Ireland
BACKGROUND
Why should we understand pathways?

For mitigation strategies

• When/where nutrients are released and transferred to the stream
• Processes along the pathways
• Time lag
• Measures for policy making
Pathways

I. Overland flow (Surface runoff)

II. Interflow:
   - subsoil
   - perched water
   - drains

III. Baseflow (Groundwater):
   - weathered bedrock
   - interconnected fissures
   - isolated fissures
UNCERTAINTIES

I. Experimental design
   • Spatiotemporal variation in recharge, land management/sources, soil, geology and topography

II. Methods
   • Focused approach
   • Integrated approach
   • Observations and conceptual understanding

III. Interpretation
   • In-stream processes
   • Point sources

IV. Mitigation
   • Right measure?
ANALYSIS
Estimation of pathways

End Member Mixing Analysis

Loadograph Recession Analysis
AGRICULTURAL CATCHMENTS

Grassland A
Well drained 7.9 km²

Grassland B
Poor-mod drained 11.5 km²

Arable A
Well drained 11.2 km²

Grassland C
Poorly drained 6 km²

Grassland D
Well drained (karst) ~30 km²

Arable B
Poor-mod drained 9.8 km²

The Irish Agriculture and Food Development Authority
RESULTS

Grassland A
Well drained

Grassland B
Poor - mod drained

Arable A
Well drained

Arable B
Poor - mod drained
Grassland A: Well drained soil Sandstone

- Shallow groundwater
- Deep groundwater

Graph showing changes in TRP (mg L⁻¹) and Turbidity (NTU) over time (h).
Arable B:
Poorly – moderately drained soil
Greywacke

![Graph showing TRP, Turbidity, and Time](image)

- TRP [μg]
- Turbidity [NTU]
- Time [h]

Shallow groundwater
Deep groundwater
Interpretation of pathways

Grassland A
• Well drained soil
• Sandstone and mudstone

Grassland B
• Poor-moderately drained soil
• Rhyolitic volcanic and slate

Arable A
• Well drained soil
• Slate and siltstone

Arable B
• Poor-moderately drained soil
• Calcareous greywacke and mudstone
IMPLICATIONS AND CONCLUSIONS

1. Estimating pathways requires holistic insight in processes and spatiotemporal variation
2. We introduced a method (“LRA”) to identify and quantify N and P pathways
3. Subsurface pathways need to be considered for mitigation strategies for diffuse P transfer
4. Long recession may be significant for ecological status of receiving rivers
5. Buffer strips may not be effective in reducing annual diffuse P loss – if bypassed
6. Point source mixing occurs – overestimates belowground pathway delivery
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