Assessing the sediment dynamics of two contrasting agricultural catchments in response to extreme rainfall events

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Introduction

- Agriculture impacts hydrology of the land: livestock grazing, tillage and cropping modify the way in which water and sediment move across a catchment.
- Climate change is expected to result in the increased intensity and frequency of extreme rainfall events.
- A need to understand how agricultural catchments under different land management practices respond to extreme rainfall events.

Aims

- Consider the relationship between agricultural **land use** and catchment hydrology.
- Determine the **impact of extreme events** on sediment transport and delivery.

Methods

- Hydrological data for two catchments within Co. Wexford, IE: **Ballycanew** (BC) and **Castledockerell** (CD). Data collected as part of the Agricultural Catchments Programme (ACP Teagasc)
- Long-term meteorological data from Met Éireann.

Ballycanew

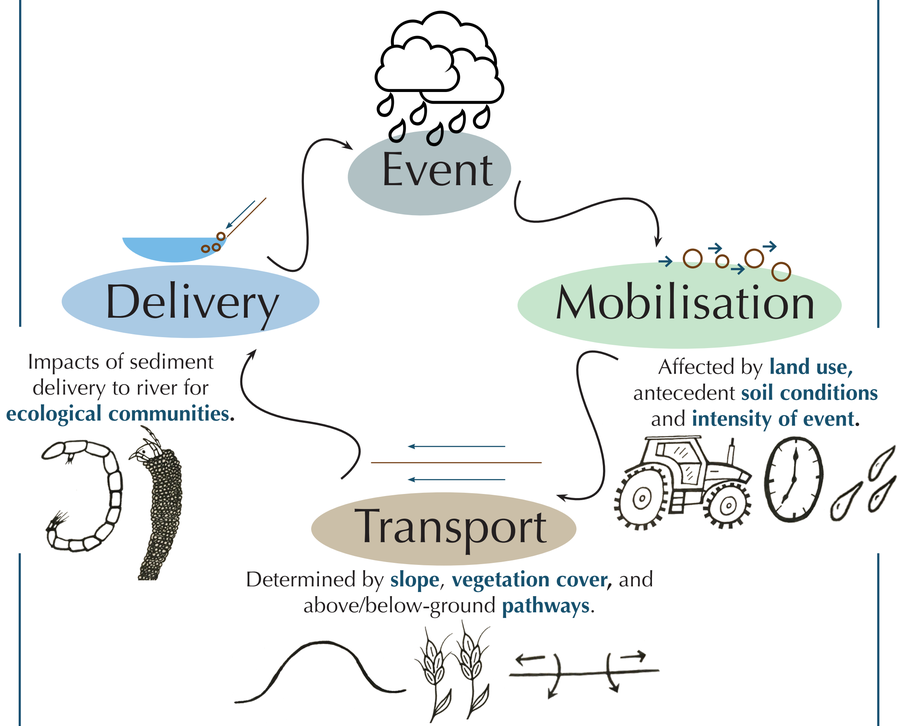
78% grassland, 20% tillage

Castledockerell

39% grassland, 54% tillage

Data analysis

- Study was data focussed: river discharge, rainfall, soil moisture deficit and suspended sediment.
- Nine years of seasonal data (**Winter**, Sept - Feb/ **Summer**, March - Aug) for BC and CD were analysed.
- Hydrological response to extreme (95th percentile) rainfall events contrasting between the catchments.
- **Sediment pulses** found to be more frequent in winter, and larger during extreme events for both CD and BC.



Key references

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Pre-event

Base-level conditions at BC

Post-event

High turbidity and sediment load

- Average sediment pulse size higher at BC than CD, reflecting **existing poor soil drainage at BC** and higher cattle stocking rates.
- Saturated soil conditions pre-event were associated with large sediment pulses in the river, during and following 95th percentile event.
- Changing seasonal vegetation interacts with soil mobilisation and transport, notable increase in winter erosion.

Conclusion

- Land management is integral to hydrology and sediment movement in catchments.
- Antecedent conditions, related to natural and modified hydrology in agricultural catchments strongly influence soil mobilisation and utilisation of above-ground pathways.
- Factors affecting sediment erosion and delivery are multifaceted, catchment-based management should reflect this.

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teagasc
Agriculture and Food Development Authority