3rd December 2020

Agricultural Catchments Programme

How Soil, Stocking Rate & the Weather Influence Water Quality

Edward Burgess

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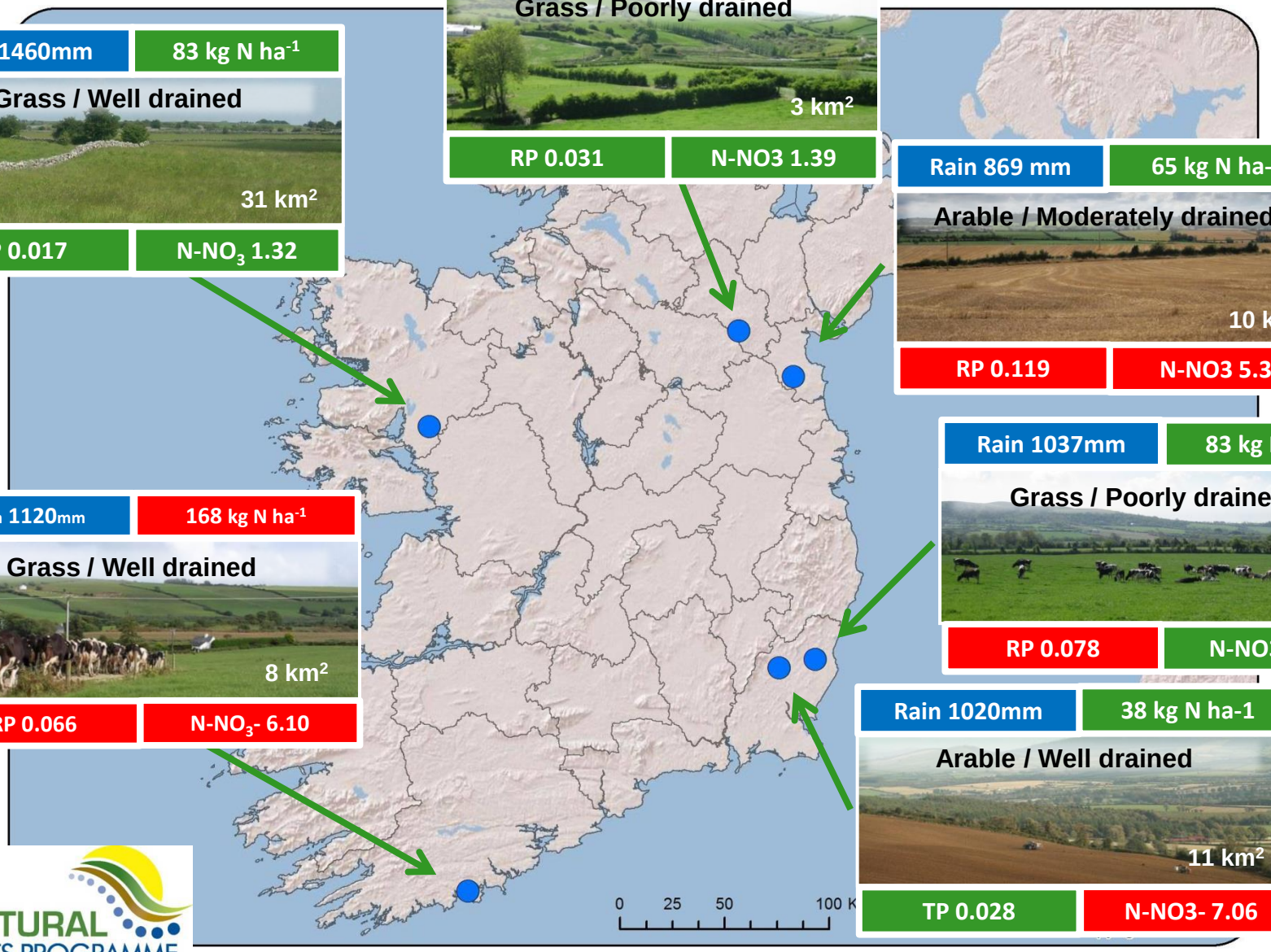
Contrasting Catchments



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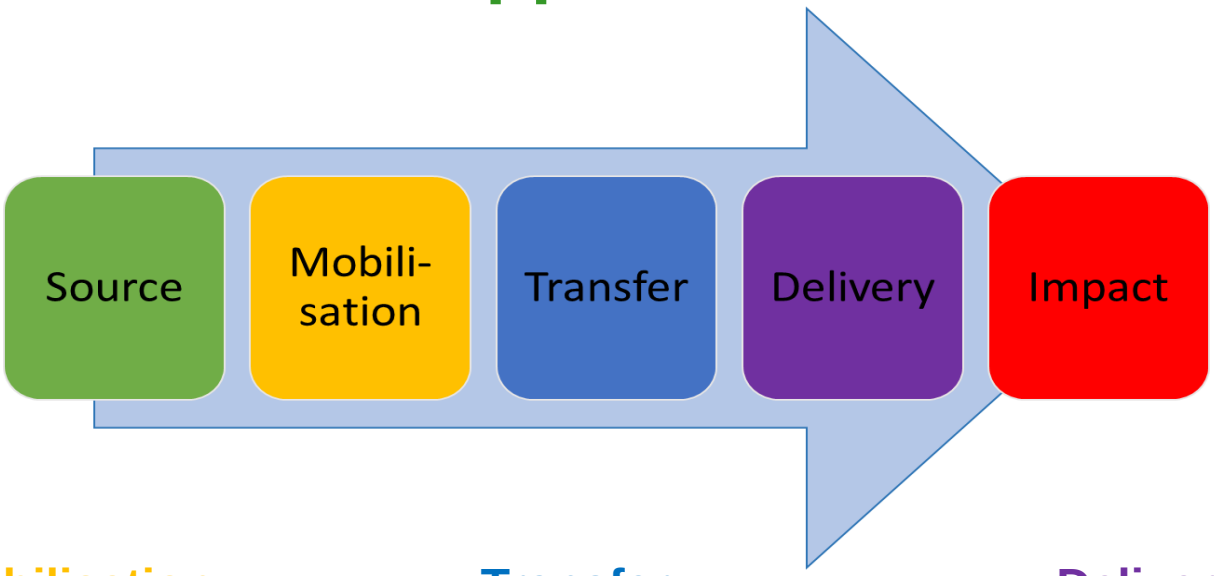
A whole catchment approach



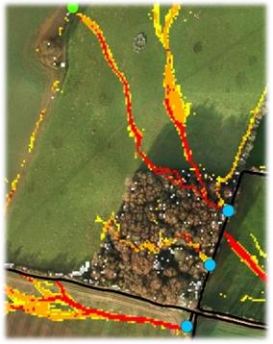
Source & Mobilisation

Farm management

Soil sampling

Weather

Transfer



Surface pathways

Delivery

Below ground pathways

Water quality & quantity

Impact

Ecological survey

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FIRST AID

Concentration & Load of Nutrient

- Quality standards are concentrations
  - P 0.035 mg / litre Ecological
  - N 11.3 mg / litre Drinking water
  - N 2.6 mg / litre Estuarine Ecological
- Load of nutrient Kilograms of N or P
  - Average per hectare – compare with inputs
  - Annual load ? Monthly load ?
  - Load after a specific event ?
    - How much P left after storm Ellen ?

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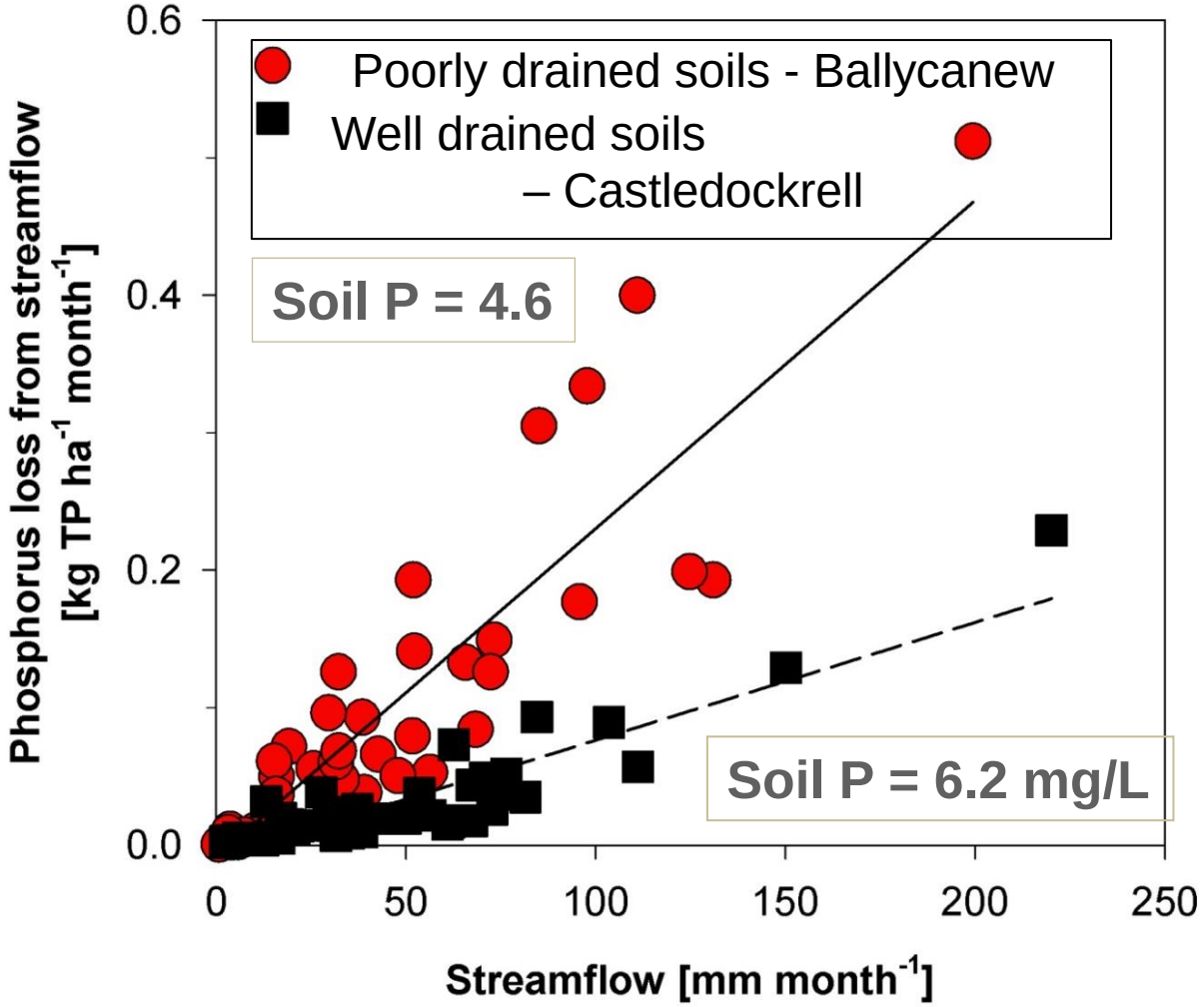
Flow pathways – Overland vs. Ground water



Key messages:

- Flow pathway overrides source
- Larger variation of P loss within a year than between catchments
- One size does not fit all!

(Mellander et al., Hyd Proc 2015)

Variability at different times of the year

Summer event (Jun 2012)

SMD = 31 mm

Rainfall = 25 mm

Stream flow = 2 mm

P loss = 1.6 g TRP/ha

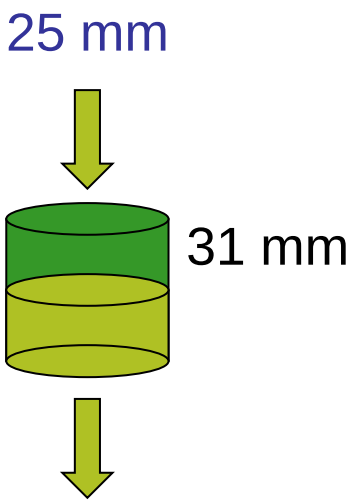
Winter event (Nov 2012)

SMD = 0 mm

Rainfall = 29 mm

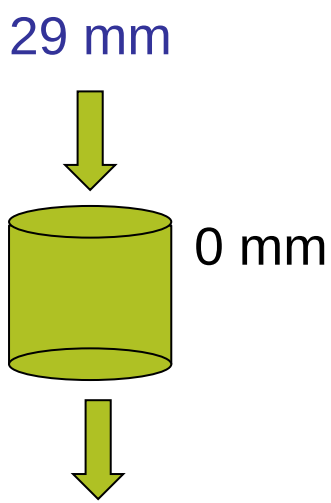
Stream flow = 20 mm

P loss = 6.5 g TRP/ha



1.6 g TRP/ha

Four times higher P loss in the winter event!



6.5 g TRP/ha

“N risky” catchment becoming “P risky”

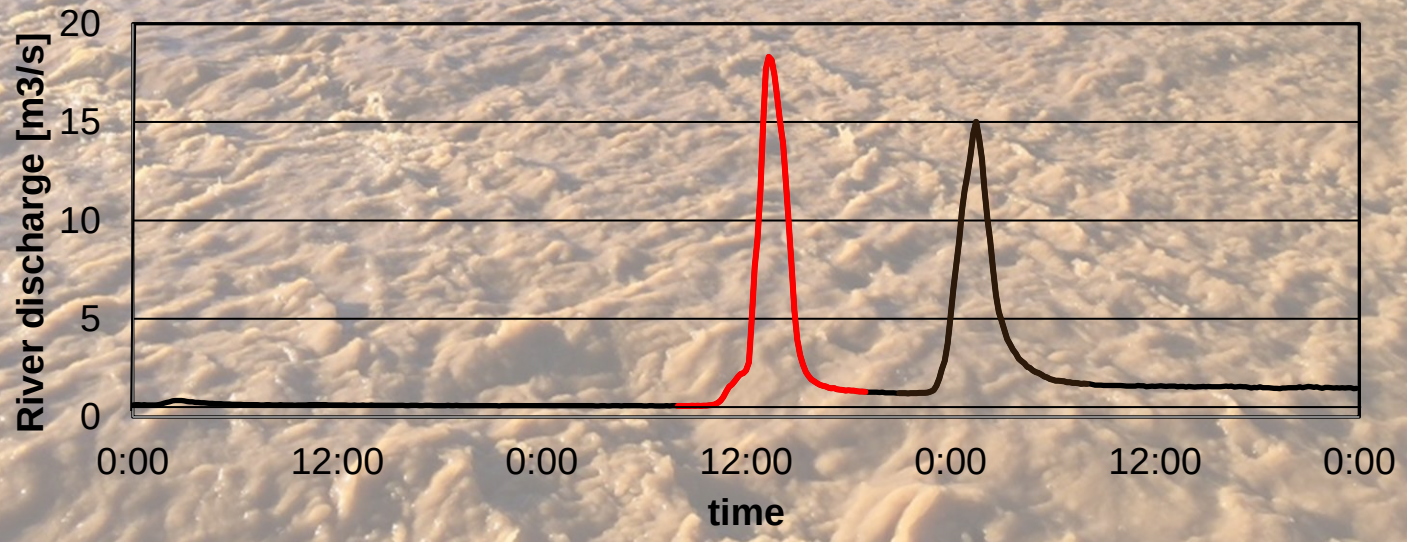
13-14th Nov 2014

0.275 kg TP/ha

67% annual average P loss

0.131 kg TP/ha

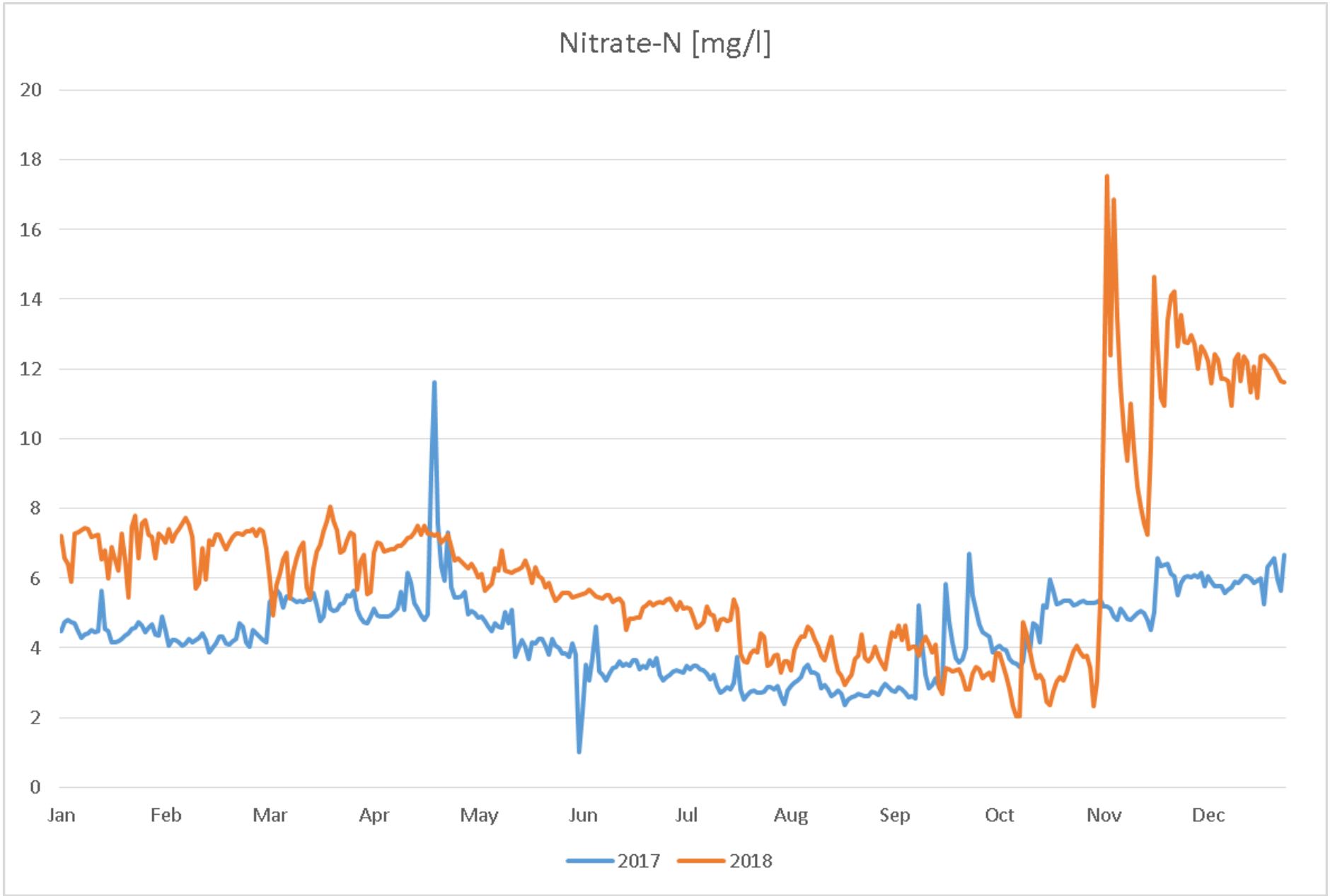
32% annual average P loss



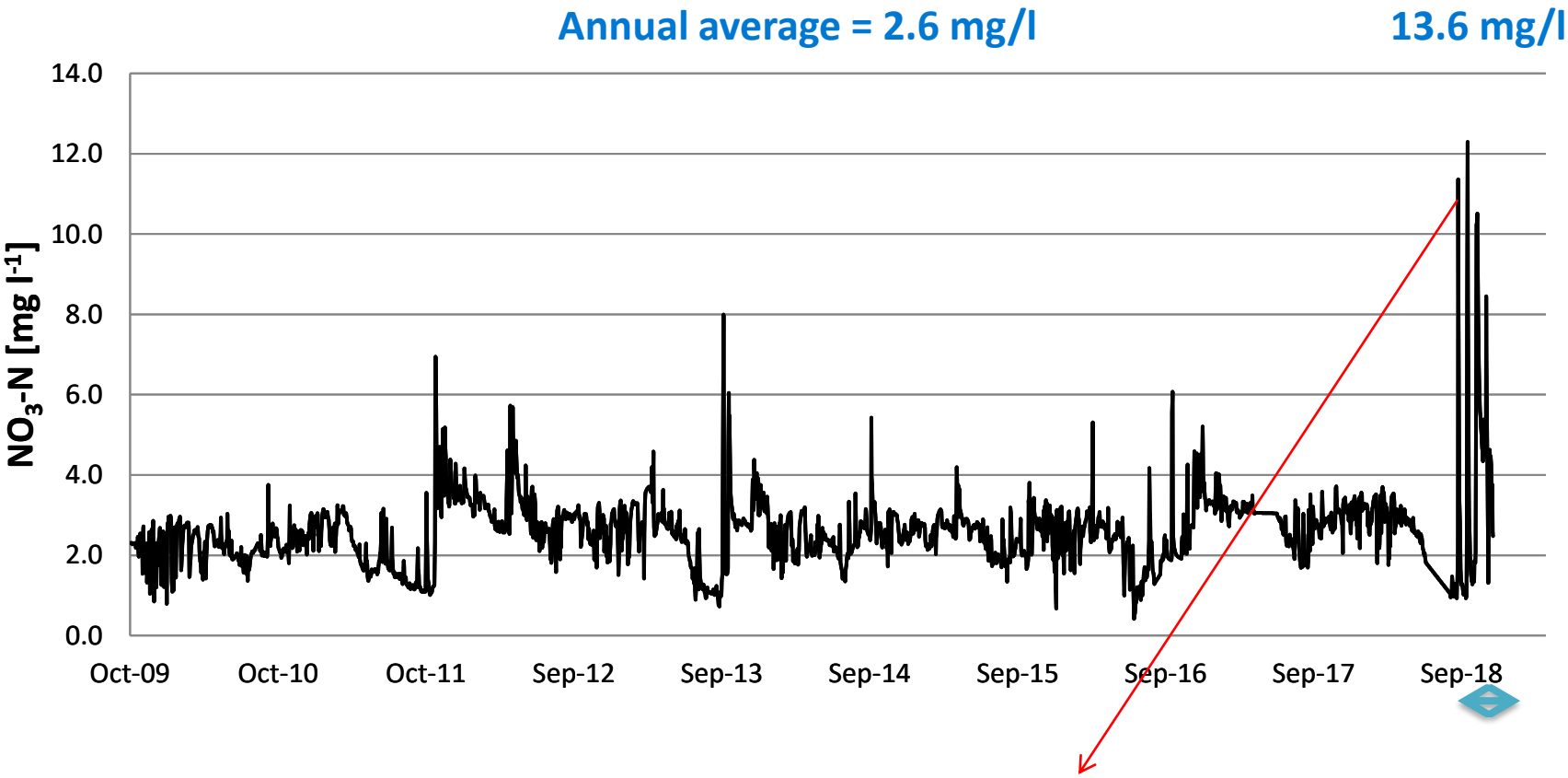
Big Flush Out vs. Constant Trickle

- Impact on Ecological Standard
- Low flow – dilution effect ?
- Where is the water going ?
  - Lake
  - Estuary / Sea
  - Drinking water source

2018 Drought & Nitrate in Water

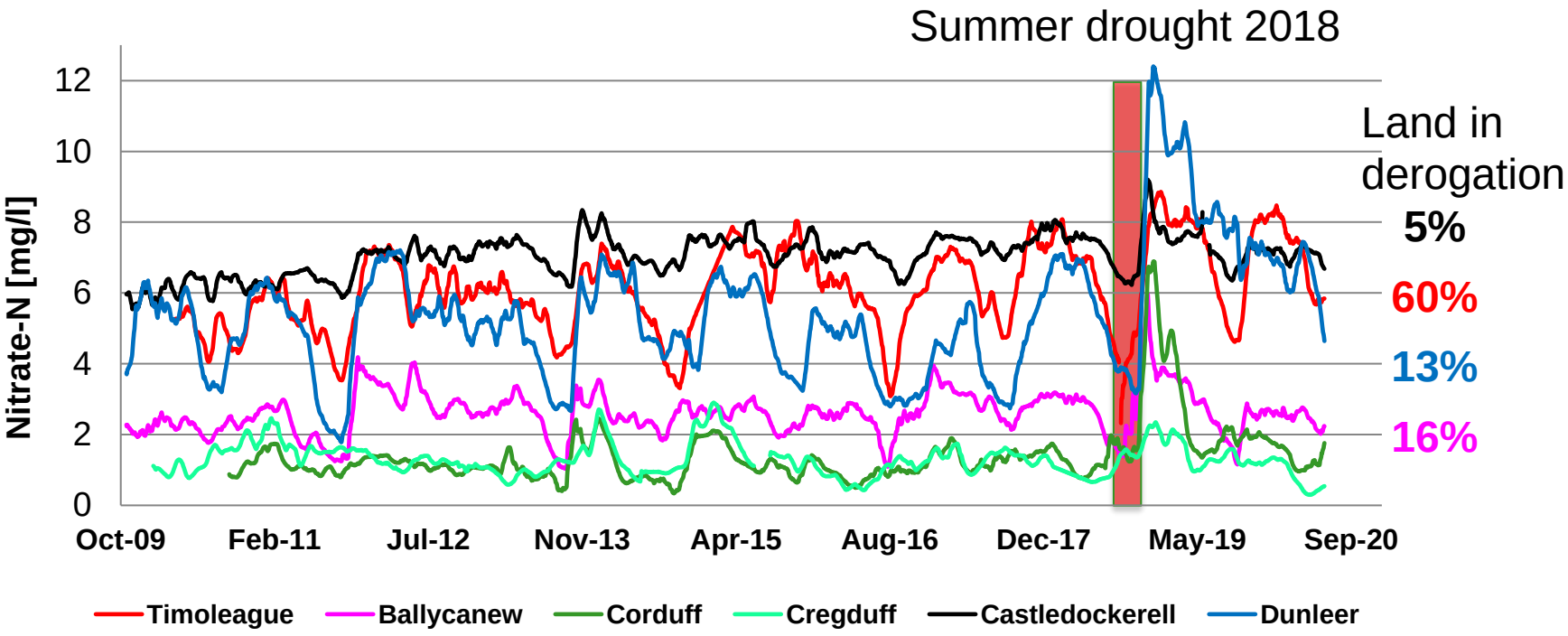


“P risky” catchment becoming “N risky” Sep - Nov 2018



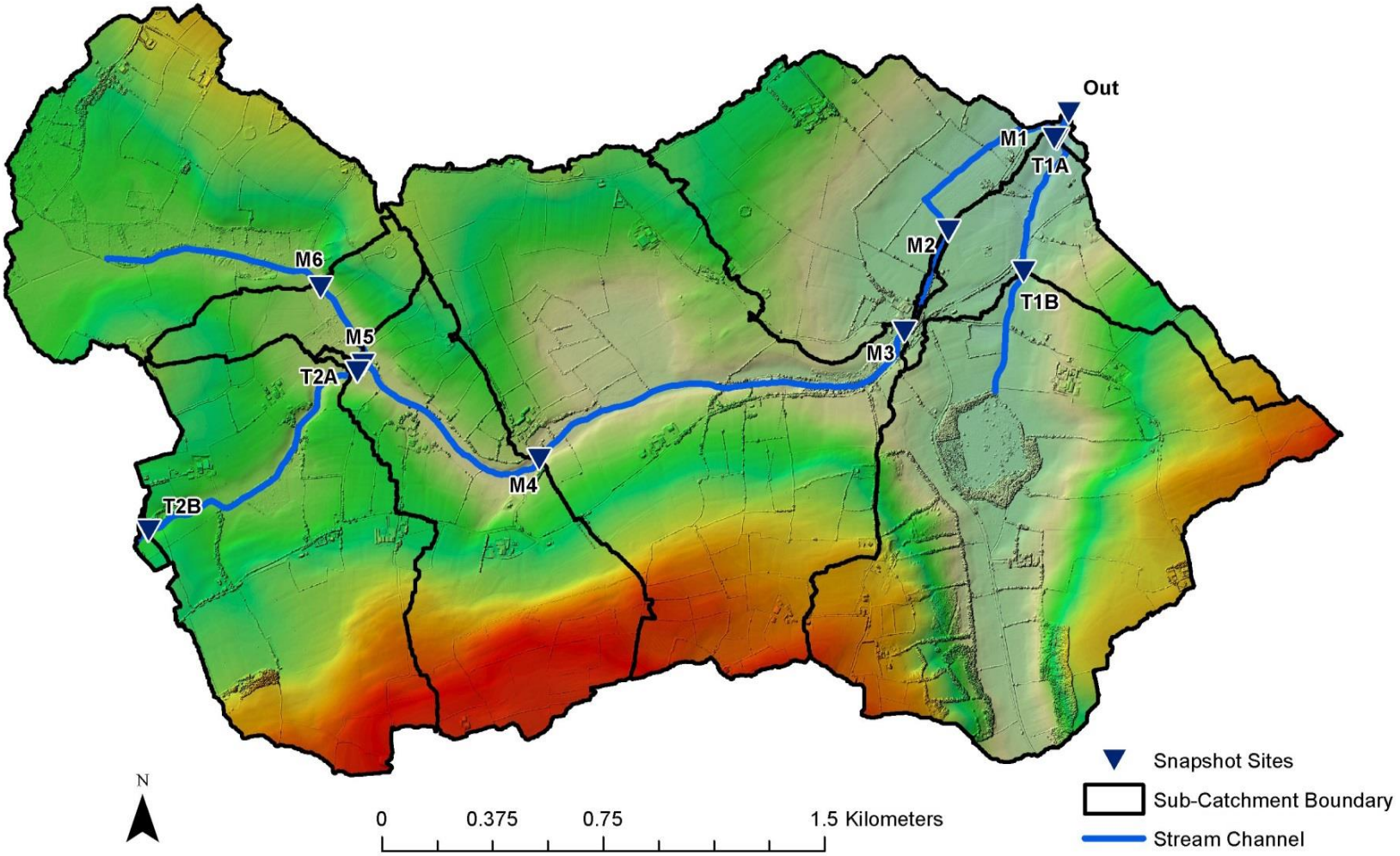
- **19 days: 6.8 kg NO_3-N ha^{-1}**
  51% of annual average load
- **73 days: 19.6 kg NO_3-N ha^{-1}**
  147% of annual average load

A whole catchment approach



- **Physical setting overrides source pressure**
- **Strong weather signal**

Catchment Snapshot Sites



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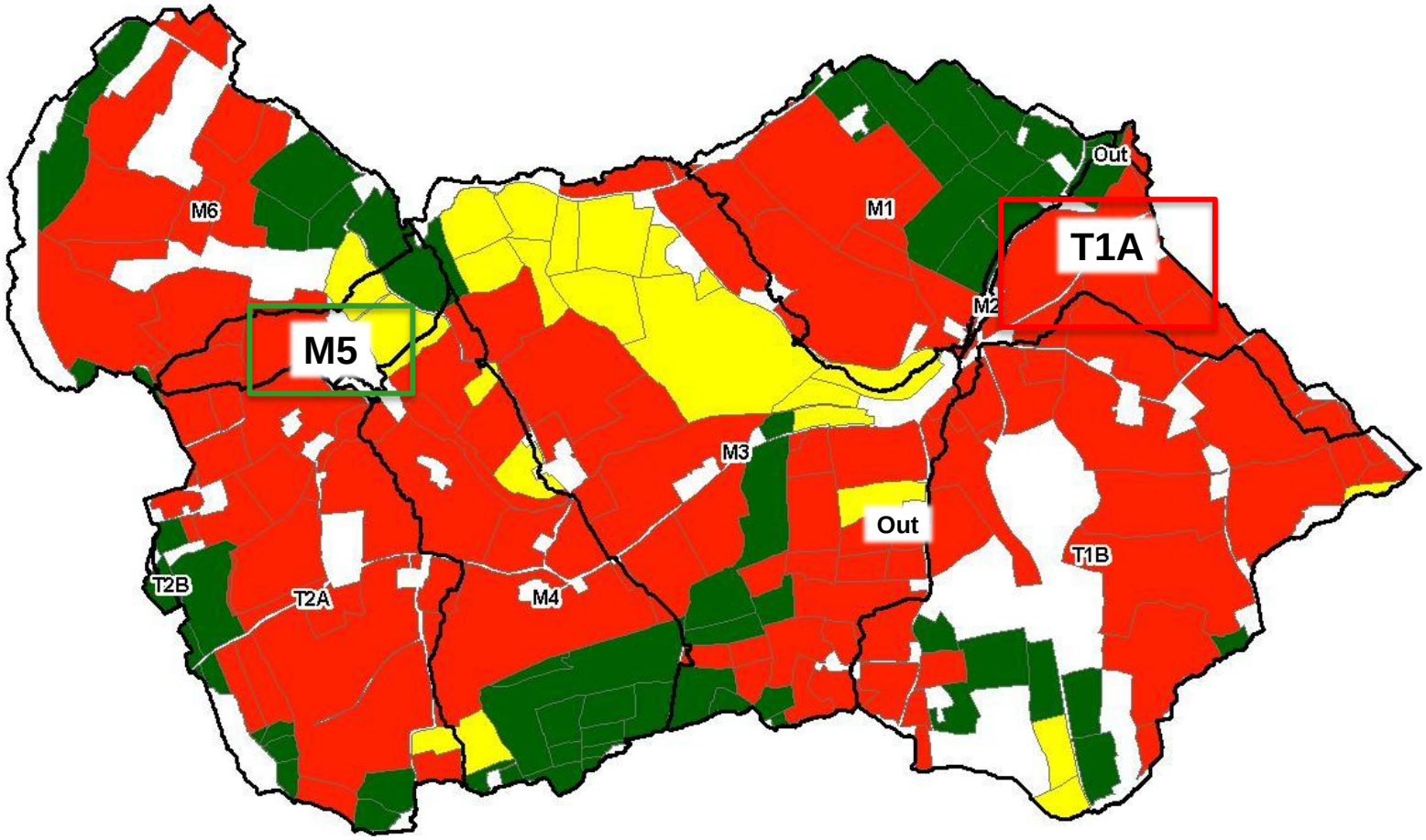
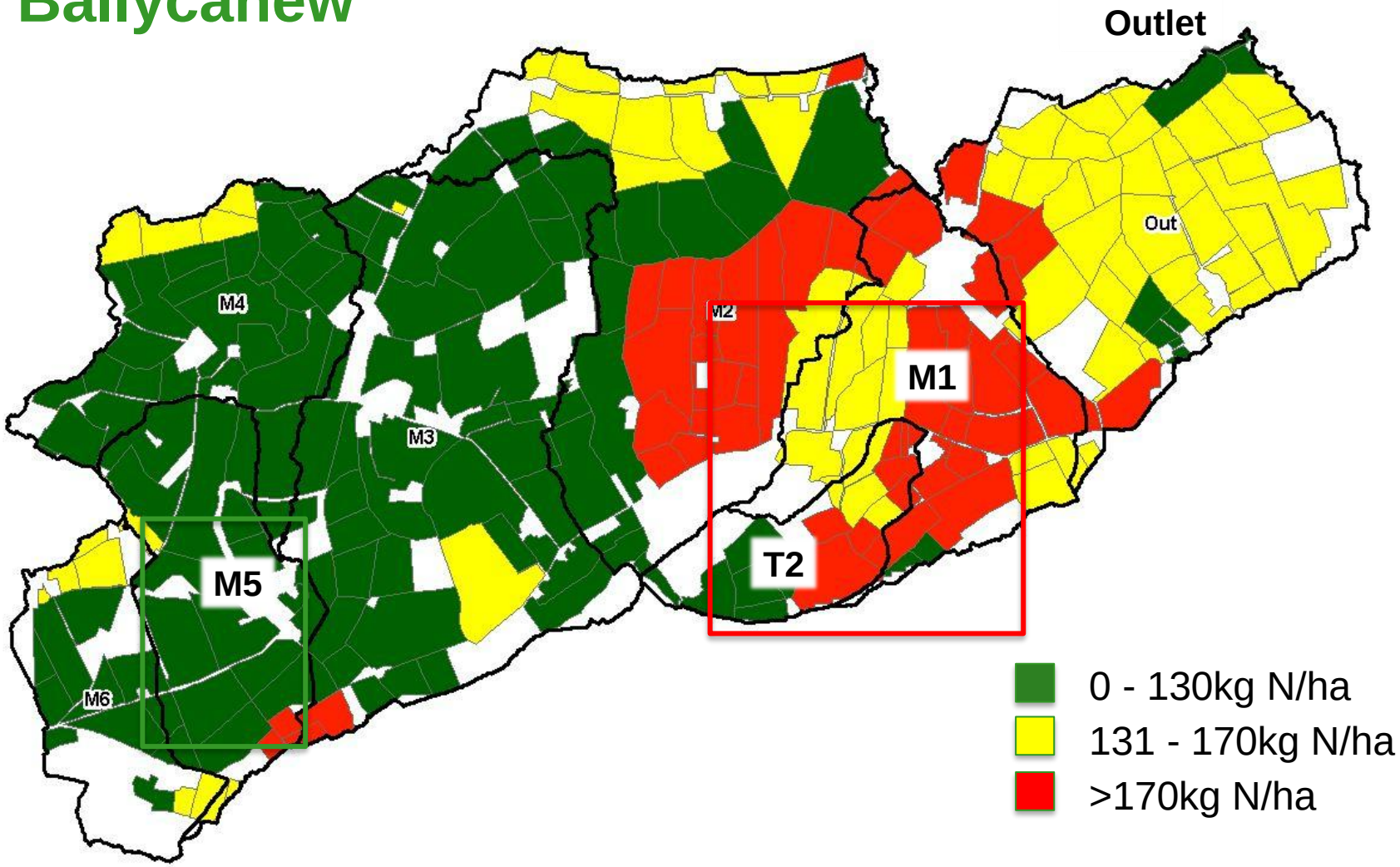
Sub-catchment approach - Timoleague



	Outlet	M5	T1A
Nitrate-N [mg/l]	6.14	4.27	5.81
Derogation [%]	60	46	85

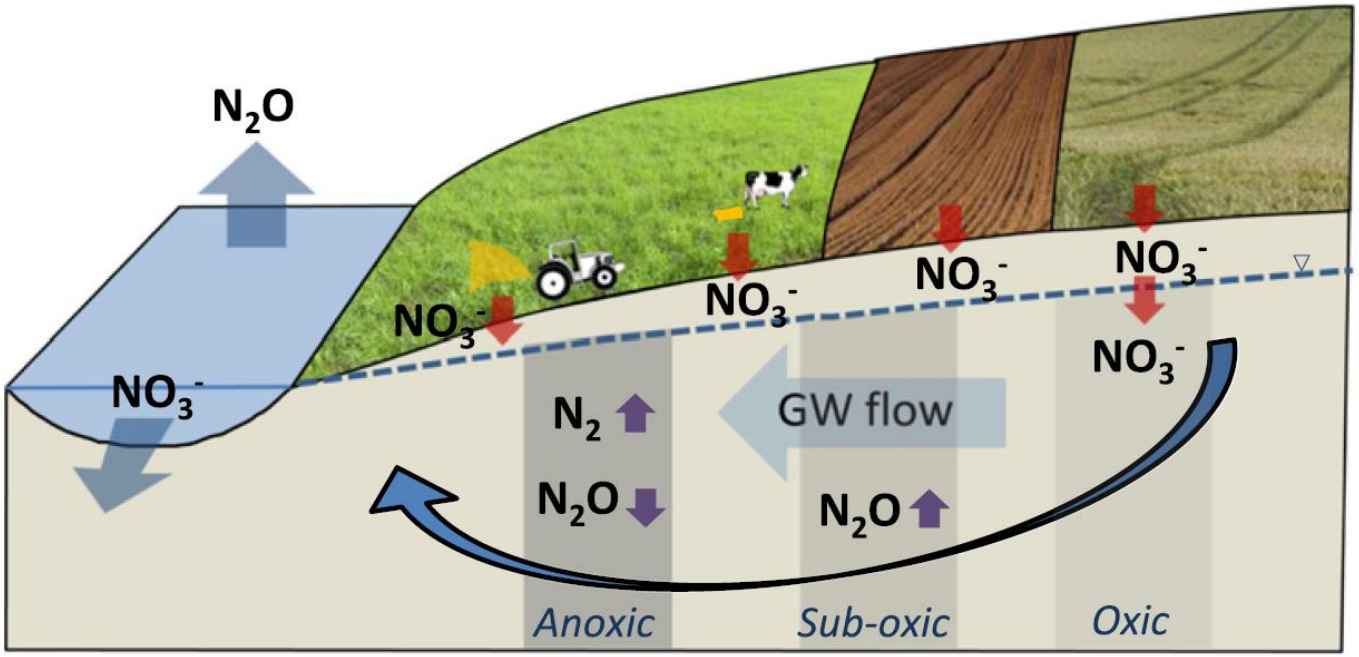
0 - 130kg N/ha
131 - 170kg N/ha
>170kg N/ha

Ballycanew



	Out	M5	M1	T2
Nitrate-N [mg/l]	2.60	3.39	2.38	3.26
Derogation [%]	16	2	49	34

Complexity of Nitrogen



[McAleer et al., STOTEN 2017]

- **A variety of soil types**
- **N removal capacity varies highly between and within catchments**
- **Transformation processes occur along the pathway from the rooting zone to surface water**
- **Poor link between N leaving the root zone and N in the stream**

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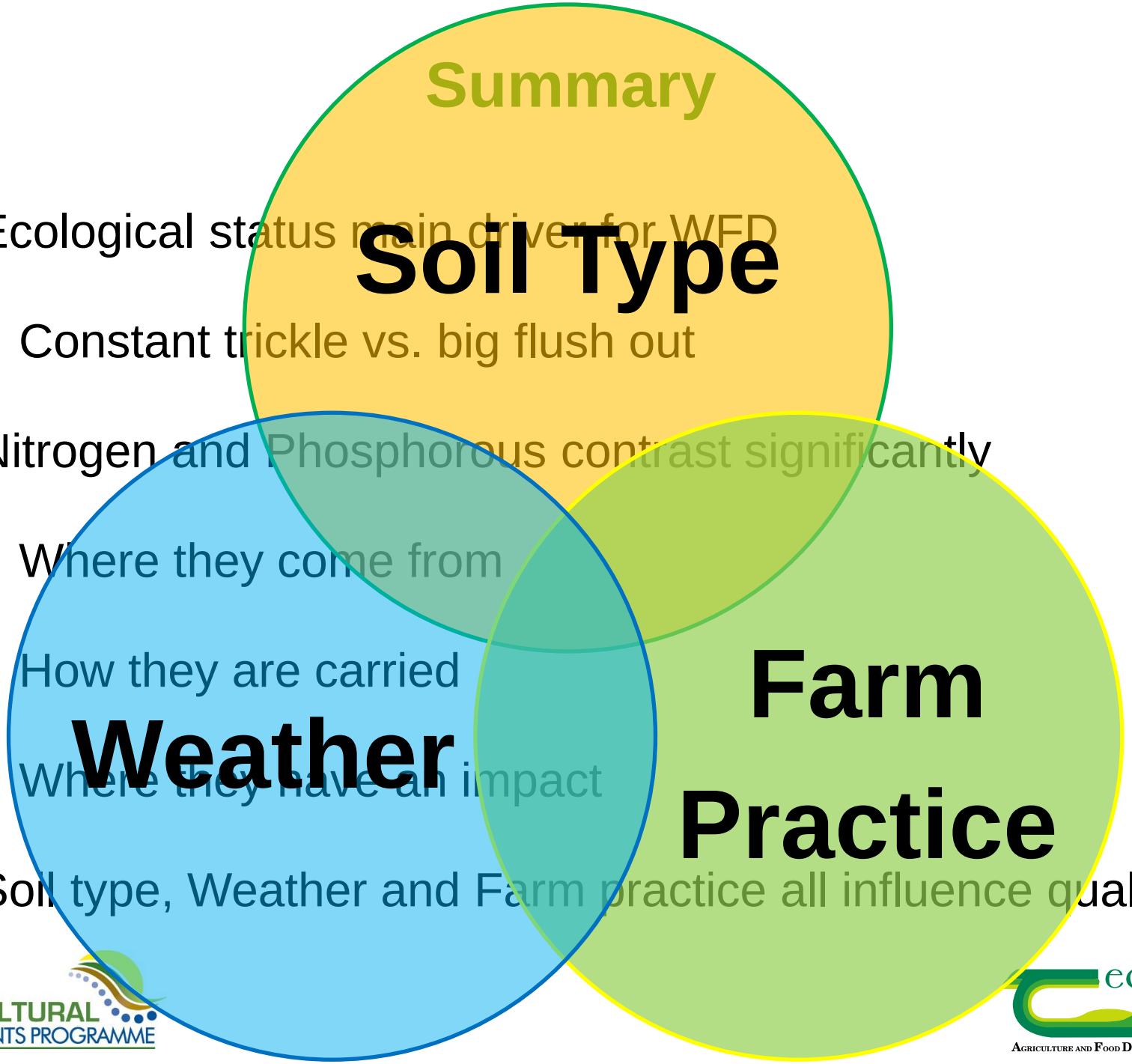
Summary

- Ecological status main driver for WFD
  - Constant trickle vs. big flush out
- Nitrogen and Phosphorous contrast significantly
  - Where they come from
  - How they are carried
  - Where they have an impact
- Soil type, Weather and Farm practice all influence quality



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