



“Achieving quality water in diverse and productive agricultural landscapes under a changing climate”

Challenges in reducing nutrient and sediment losses in agricultural catchments

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Motivation

1. Concentrations of P and N are still high,
2. Poor ecological status of water bodies,
3. The WFD deadline of 2027 might not be achieved in many EU countries,
4. Rural Development Programme (current 2014-2020) offers financial support for land owners,
5. Are these mitigation measures effective?

Mitigating diffuse losses of nutrients and sediments



Source

Mobilisation

Delivery

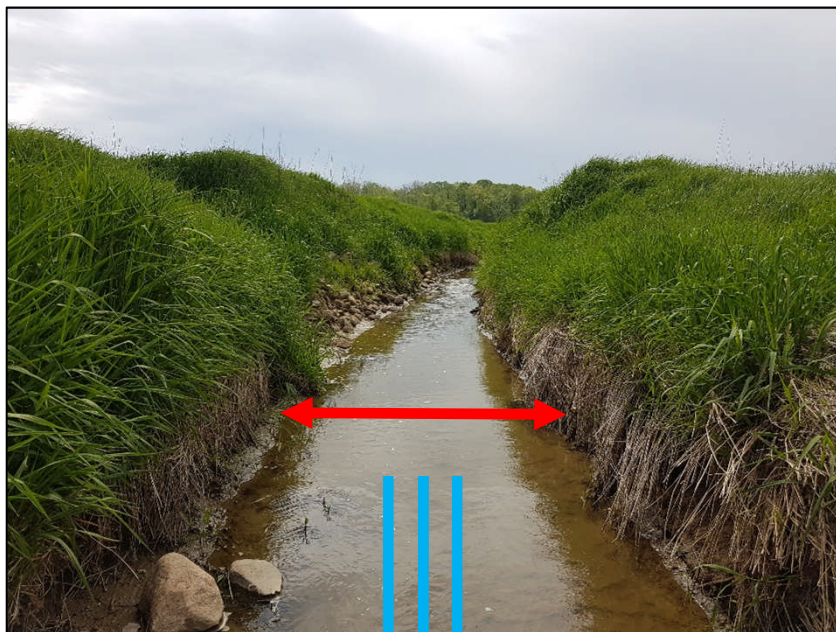
Impact

micrometres (10^{-6} m)
milliseconds (10^{-3} s)

*Space and time
and
cost of mitigation*

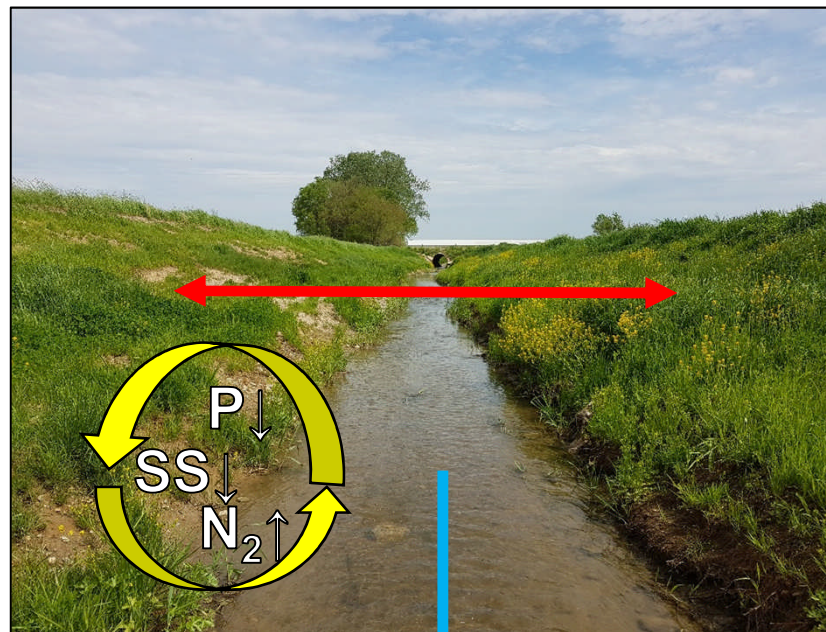
basins (10^{10} m)
decades (10^8 s)

In-stream mitigation measures



Q

Traditional ditch

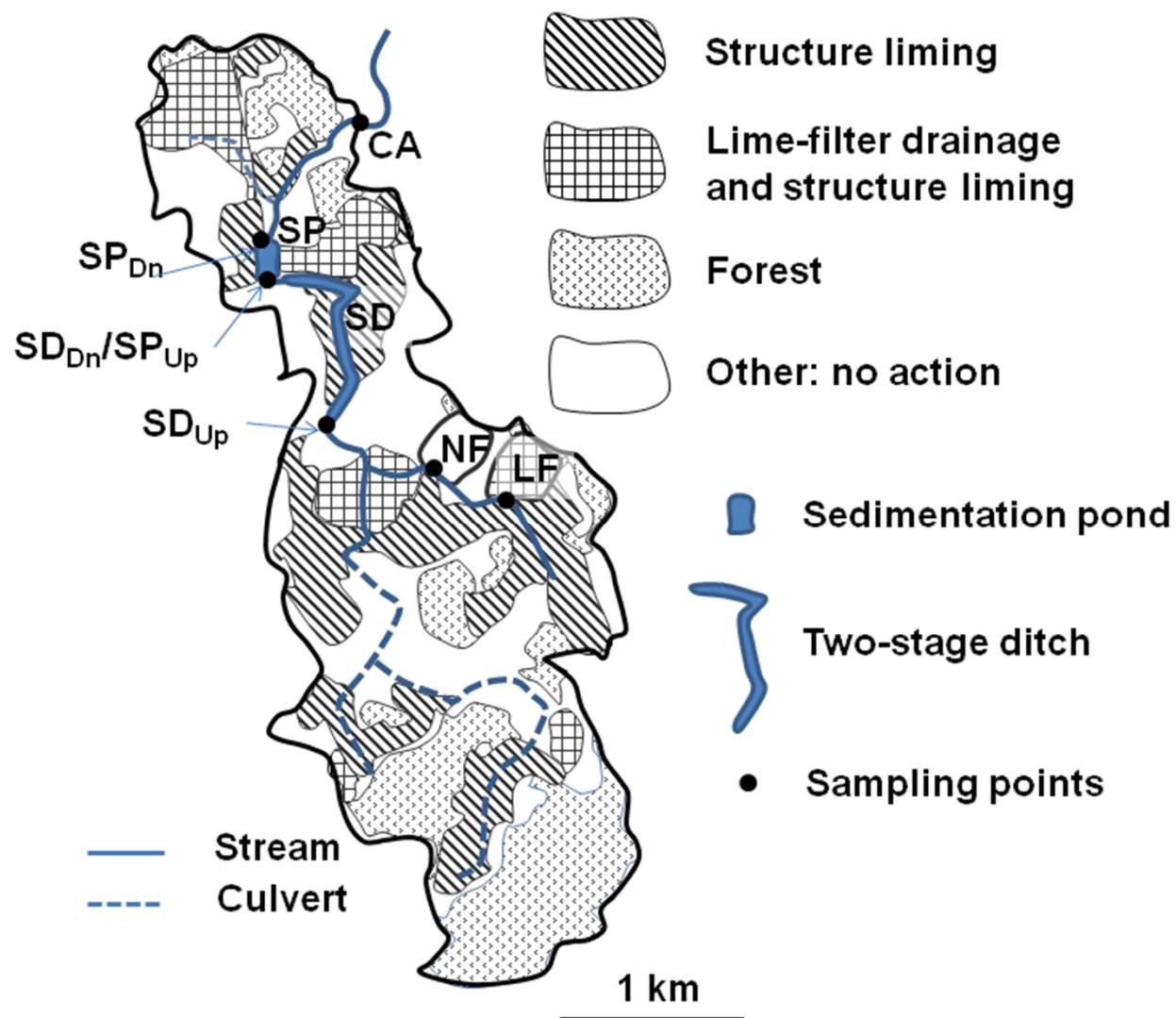


Q

Two-stage ditch



Catchment-scale mitigation programme



Catchment-scale effect

Sampling unit,
mixing

Total P and
 $\text{PO}_4\text{-P}$
15 minutes



Turbidity, nitrate, DOC
Sensor in the stream
15 minutes

Water pumped from
stream

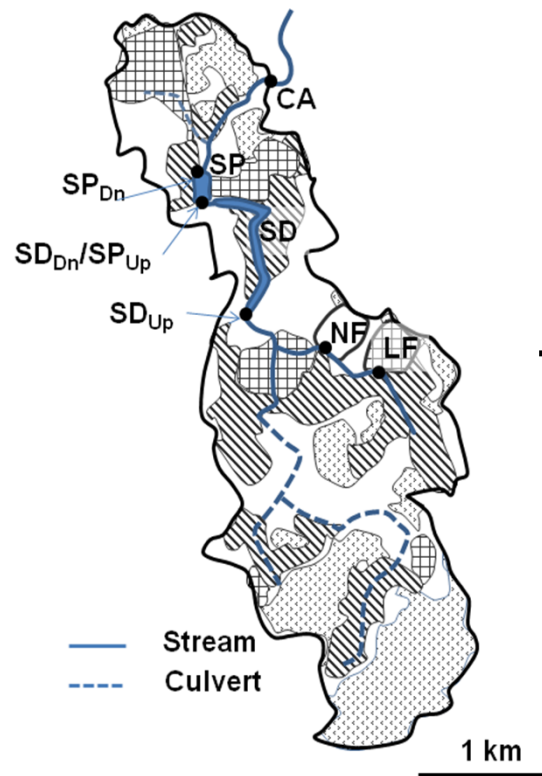
Effect of individual measures



Sedimentation pond



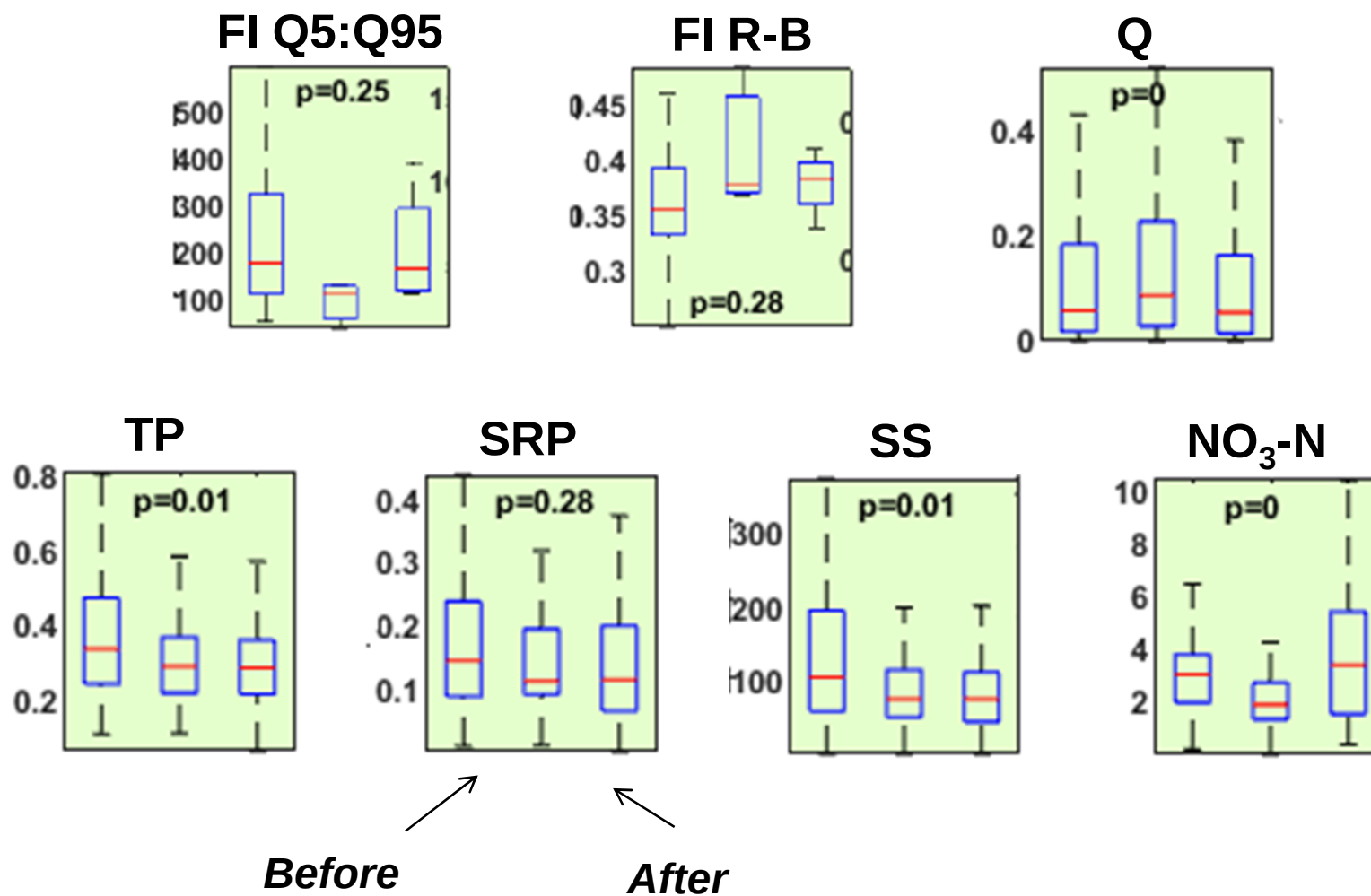
Two-stage ditch



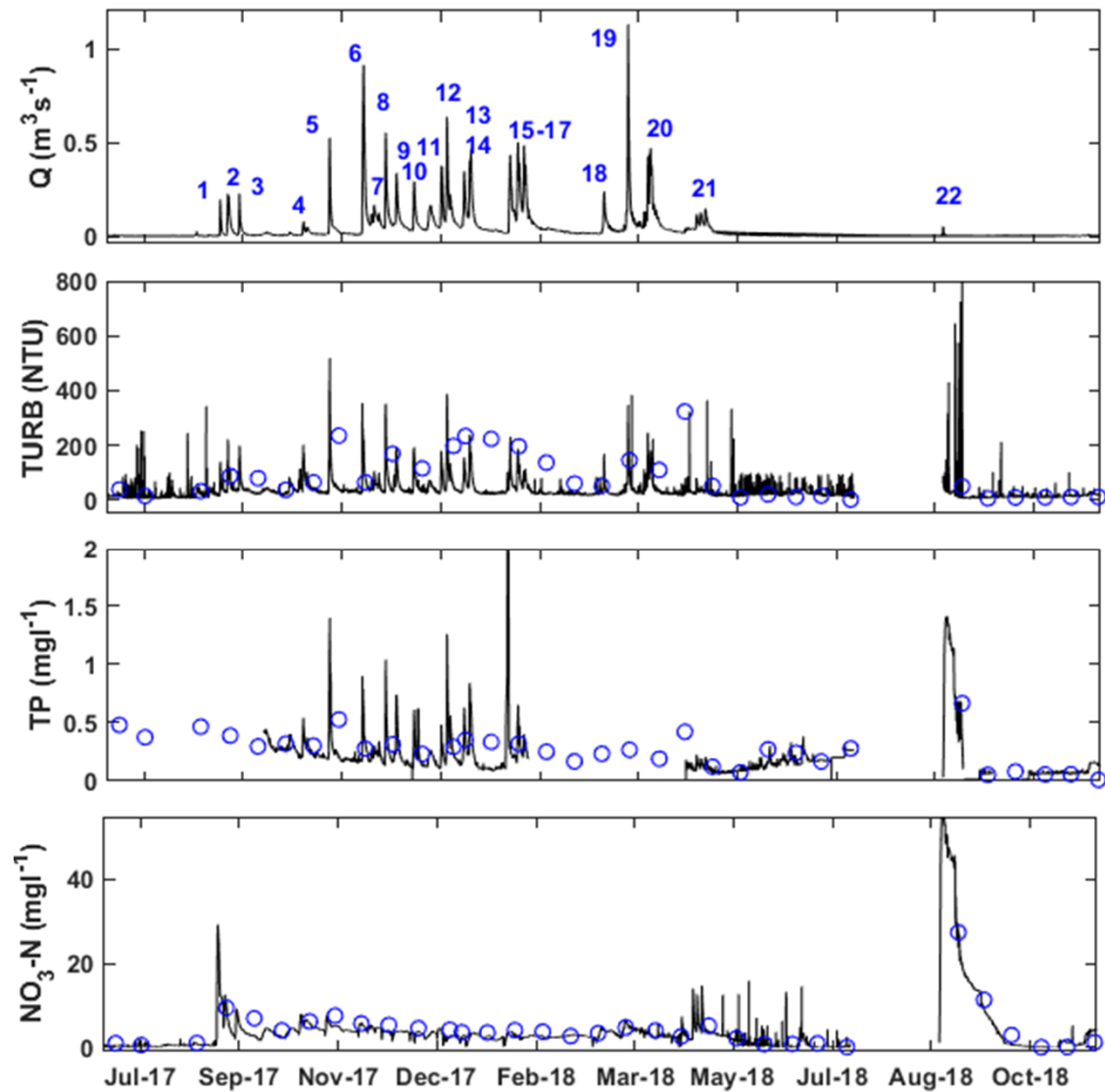
**Traditional and
lime-filter drains**



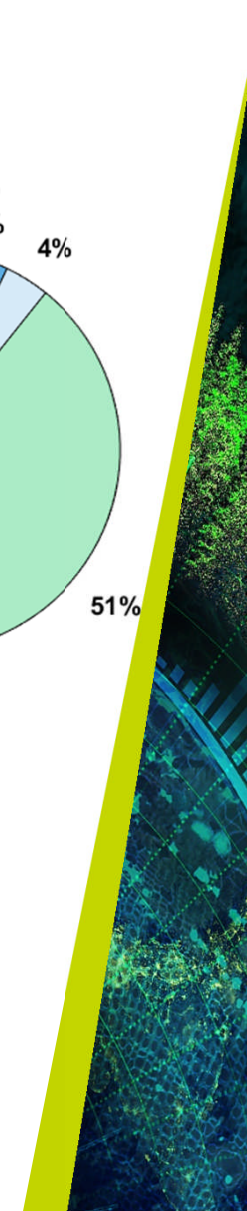
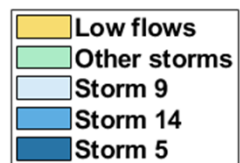
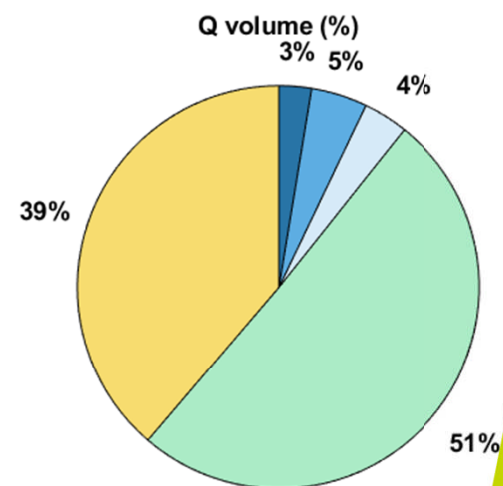
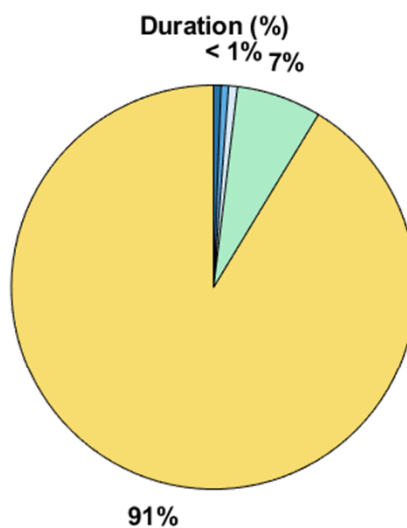
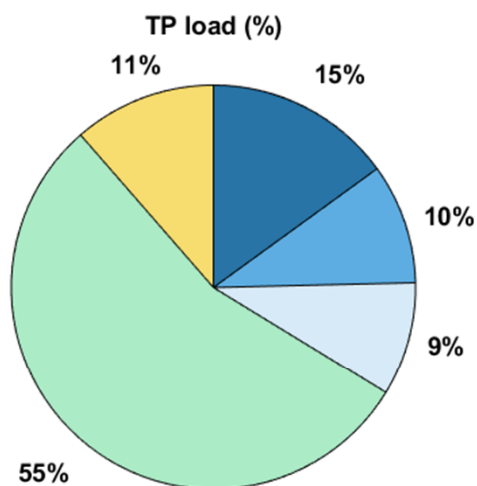
Catchment-scale effect: flow-proportional data



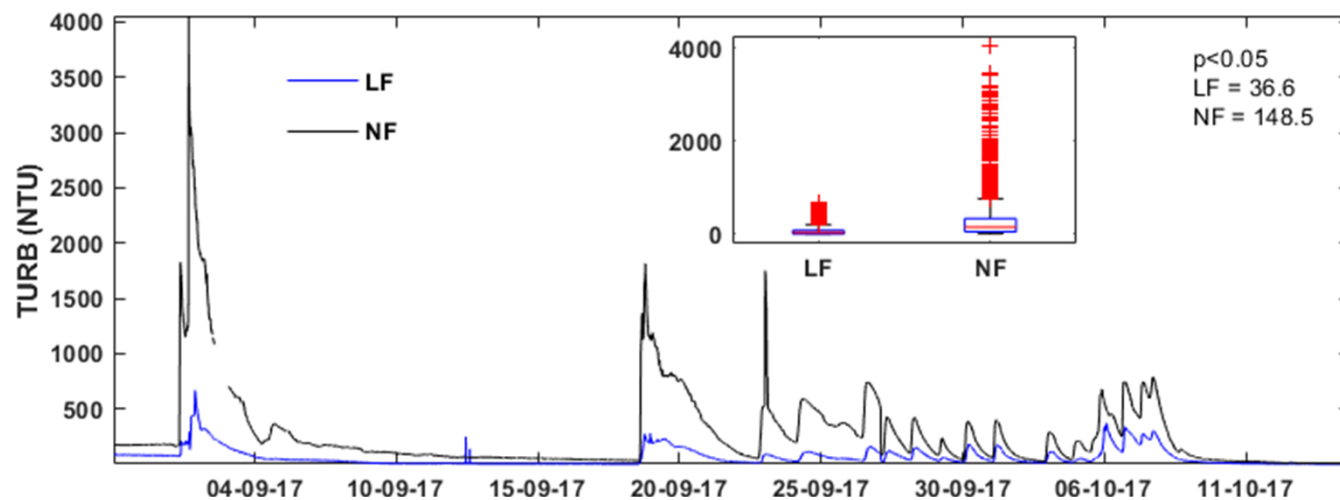
Catchment-scale effect: high-frequency data



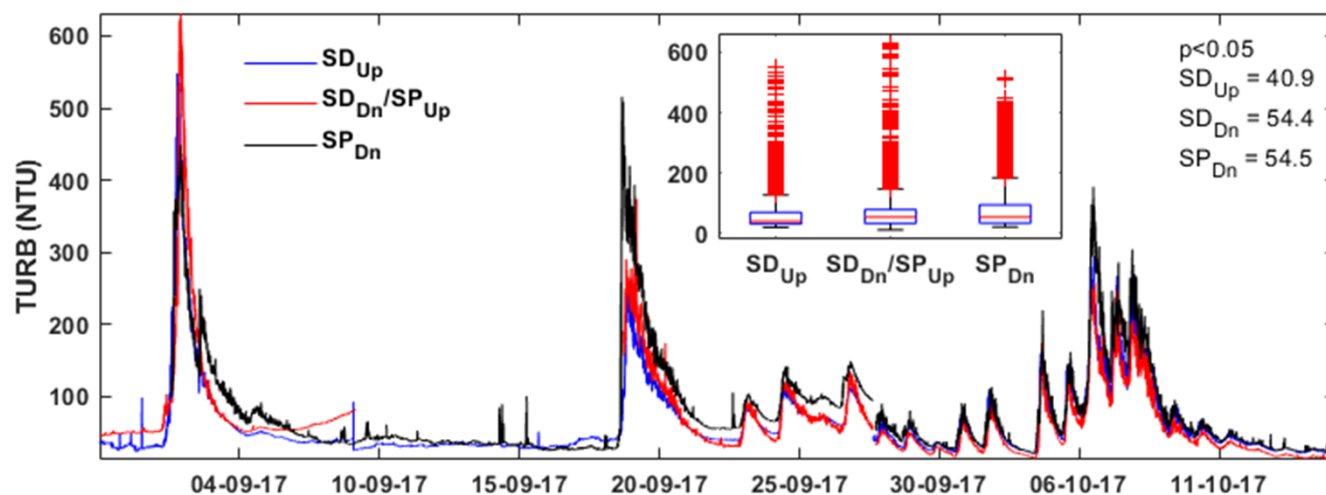
Catchment-scale effect: high-frequency data



Individual measures' effects



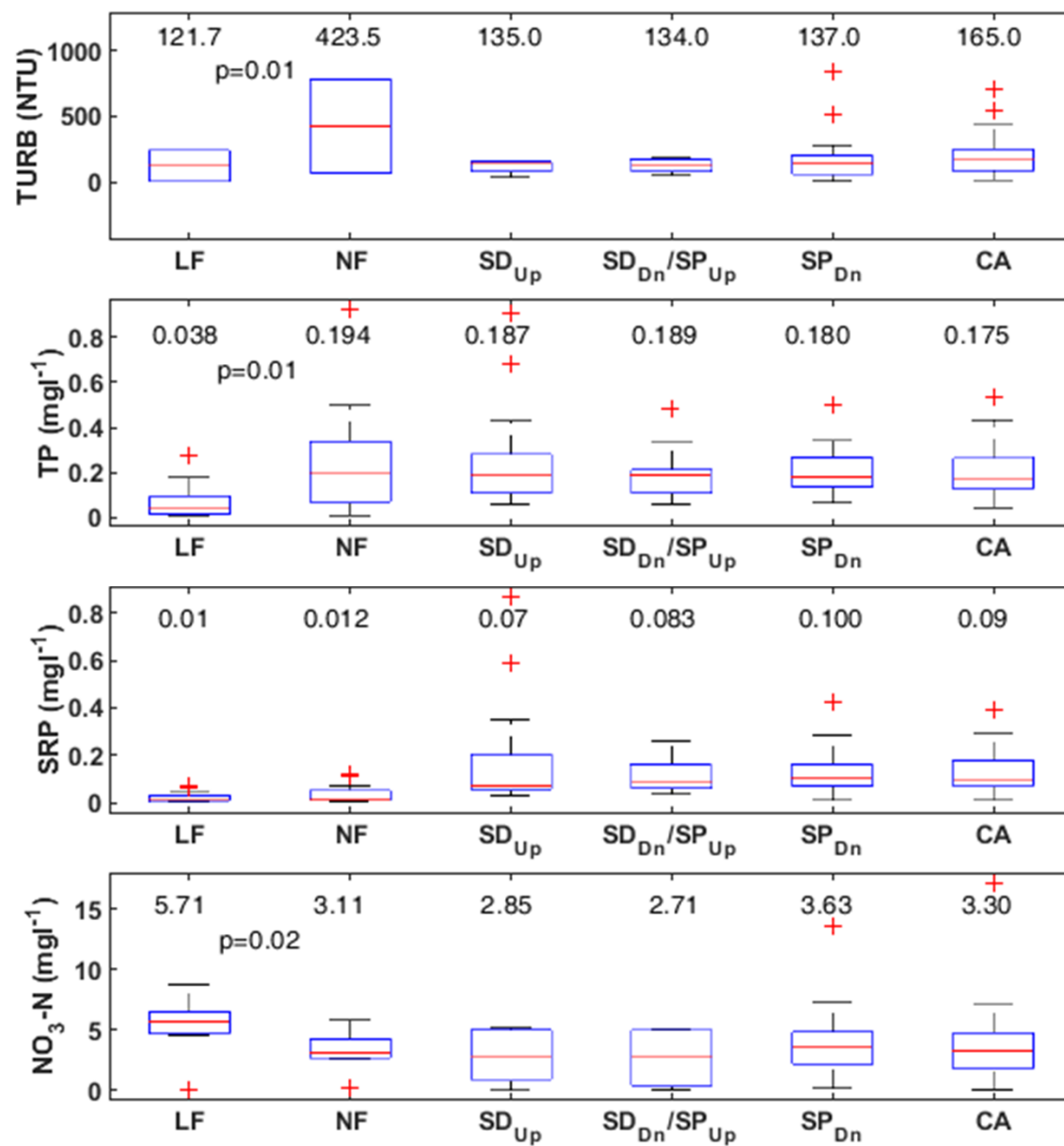
*Lime-filter vs.
normal drain*



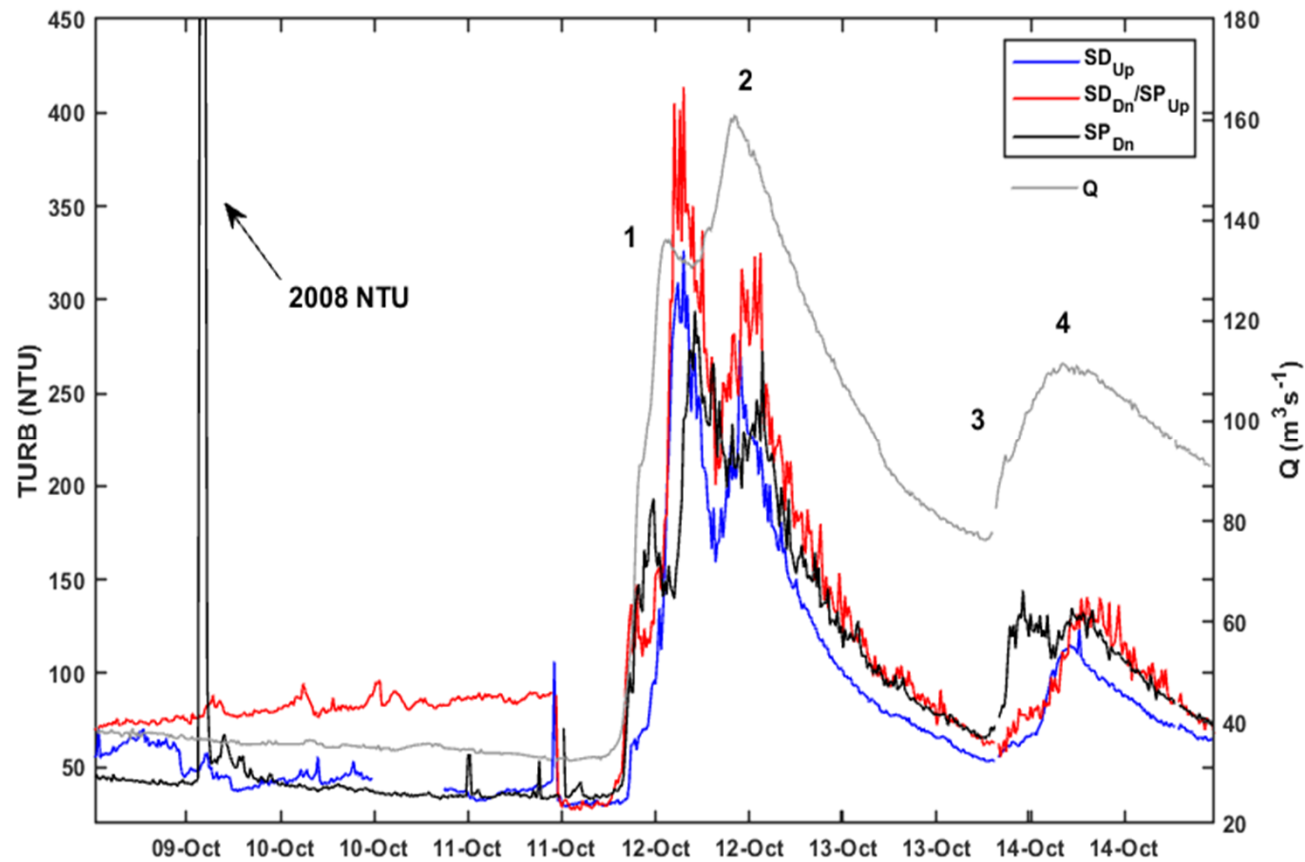
*Two-stage ditch
Sedimentation
pond*



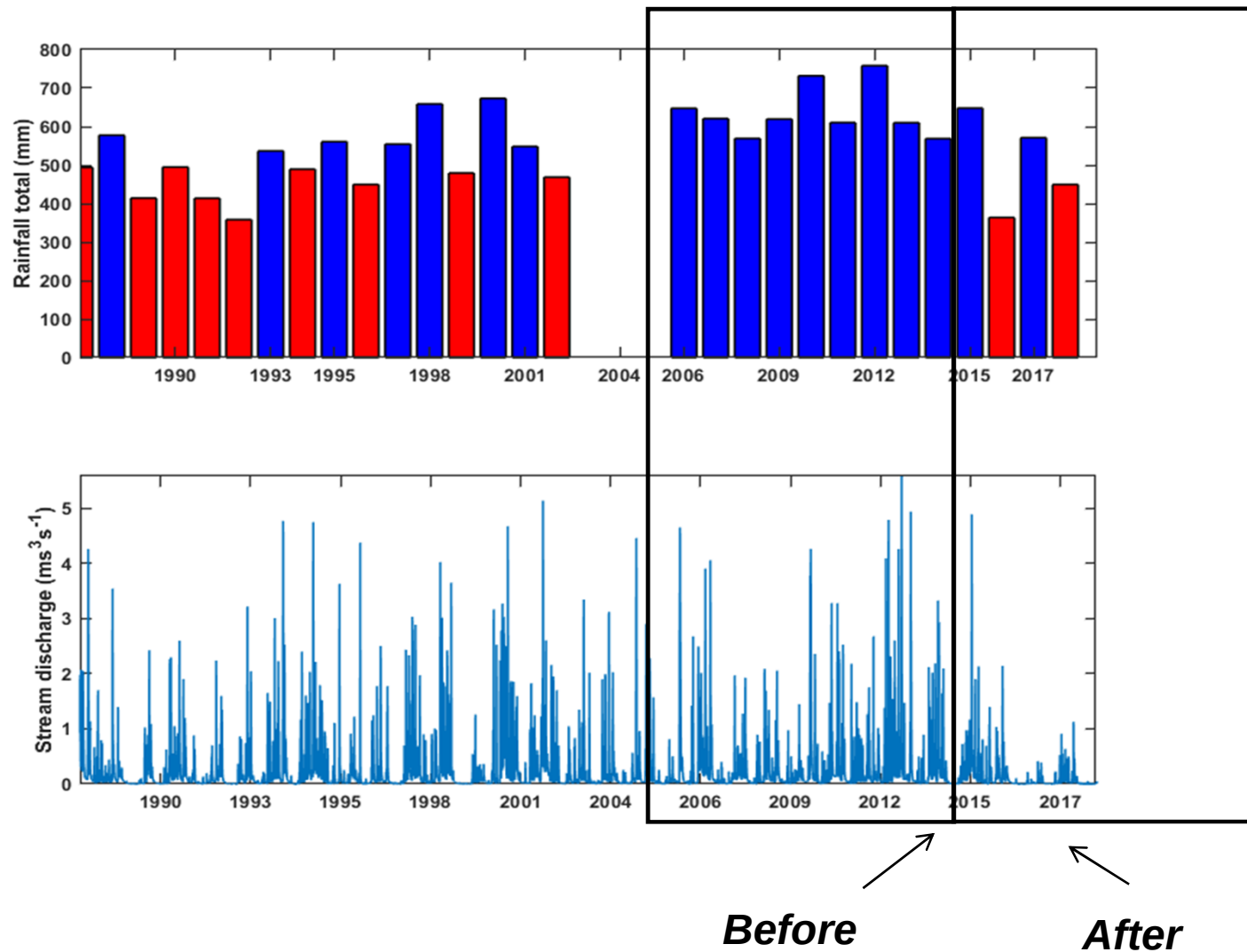
Individual measures' effects



Re-mobilisation of secondary sources



The effect of dry weather and monitoring period



Conclusions

1. Positive effect of mitigation measures on water quality at the catchment outlet,
2. Positive effect of lime-filter drains, a two-stage ditch and a sedimentation pond on water quality,
3. Potential pollution swapping: decrease in P but increase in N,
4. Hydrological extremes are important in nutrient and sediment delivery,
5. Legacy sources of nutrients produce time-lags between mitigation and effect.



4th International Workshop on High Temporal Resolution Water Quality Monitoring and Analysis

1st – 3rd June 2020

Uppsala, Sweden

Swedish University of Agricultural Sciences

We welcome **abstracts** for oral and poster presentations and expressions of interest in attending the workshop submitted by **1st March 2020** to HighRes2020@slu.se.

Keynote speakers

James Kirchner
Nandita Basu
Helen Jarvie

Contact and further information

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Acknowledgments

Journal of Environmental Quality		SPECIAL SECTION
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