Local physical habitat quality cloud the effect of predicted pesticide runoff from agricultural land in Danish streams

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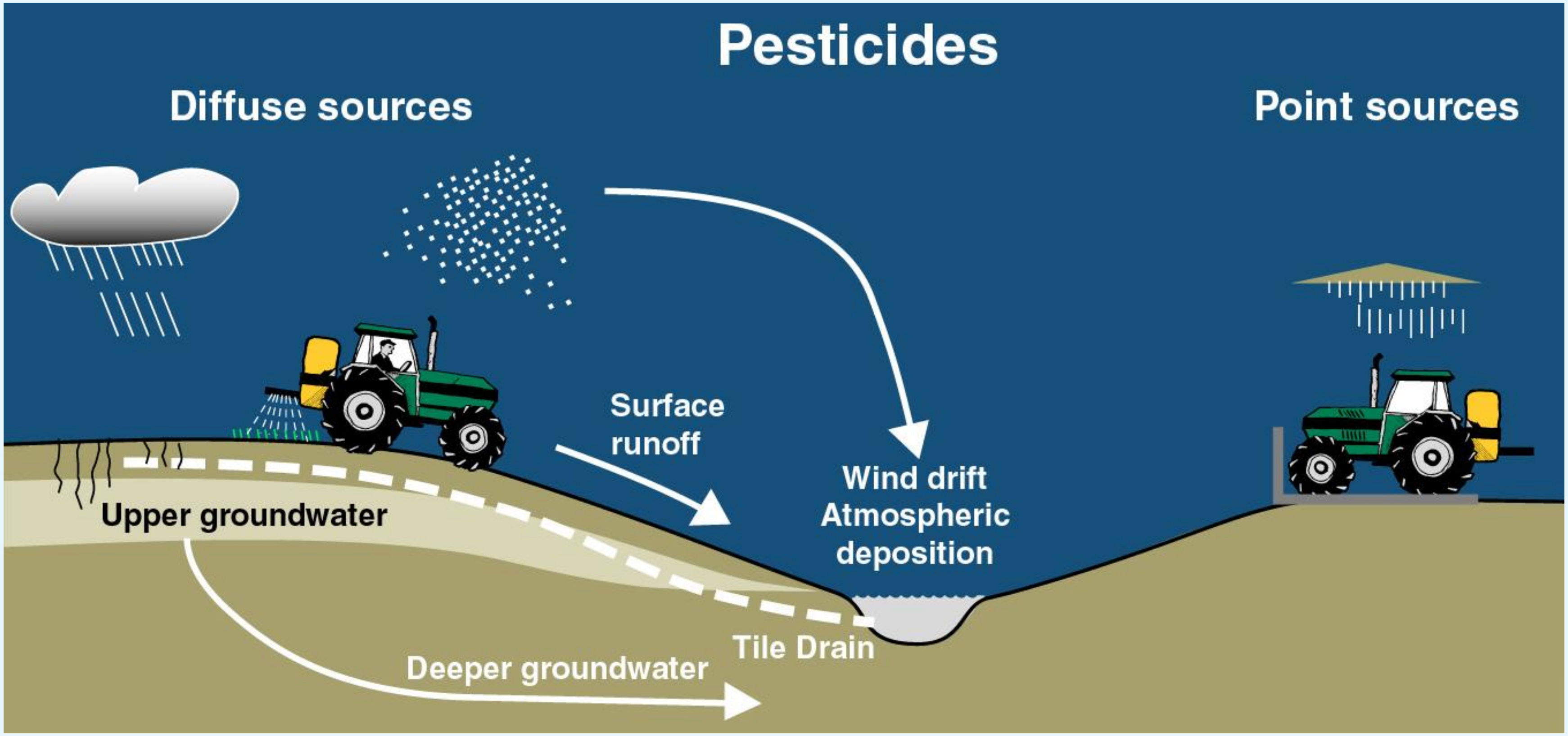
RISKPOINT

Outline

- **Transport routes for pesticides to streams**
- **Introduction to the SPEcies At Risk (SPEAR) concept**
- **Predicted pesticide runoff in Danish streams and its impact on stream macroinvertebrates**
- **The role of the physical properties**
- **Confounding factors**

I. Major transport routes for pesticides

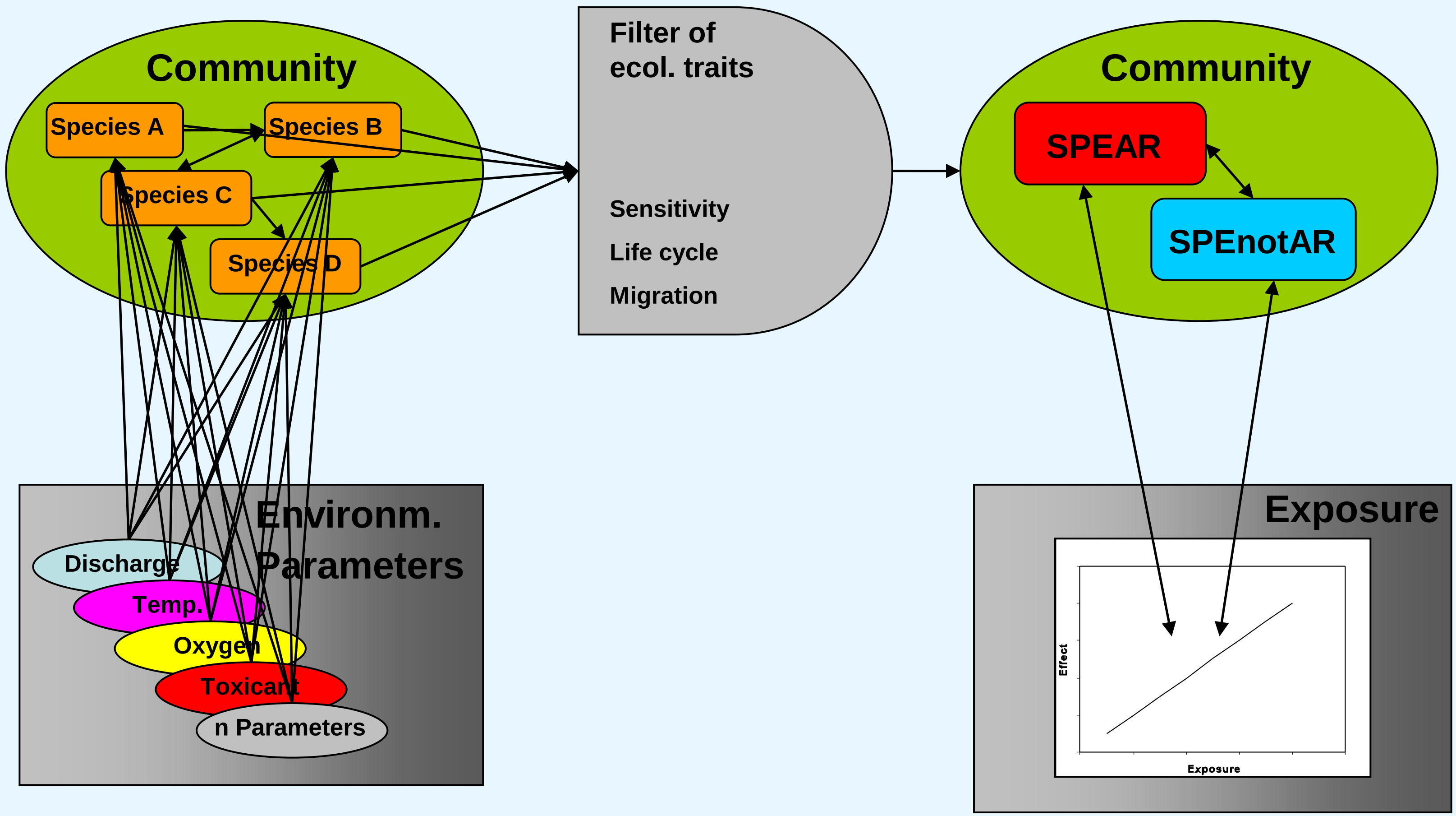


Frequency is similar while max. concentration is significantly higher in small streams

	Large streams		Small streams	
	Frequency (%)	Concentration Max (µg/l)	Frequency (%)	Concentration Max (µg/l)
Isoproturon	41	0.13	48	2.1
Diuron	37	0.073	29	0.36
Bentazon	25	0.028	37	1.2
Fenpropimorph	0	0	3	0.11
Dimethoat	2	0.034	4	0.12

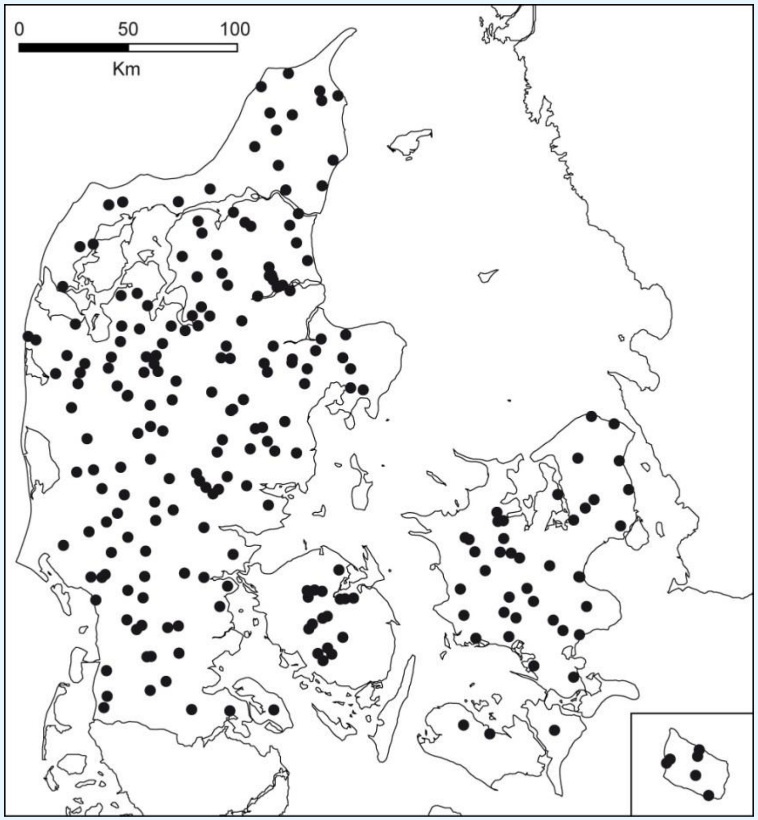
Examples of frequency and maximum concentrations of pesticides in two stream types from the Danish Monitoring Program (NOVANA)

II. SPEAR concept



Modified after Liess et al., 2008

III. Predicted pesticide runoff in DK streams

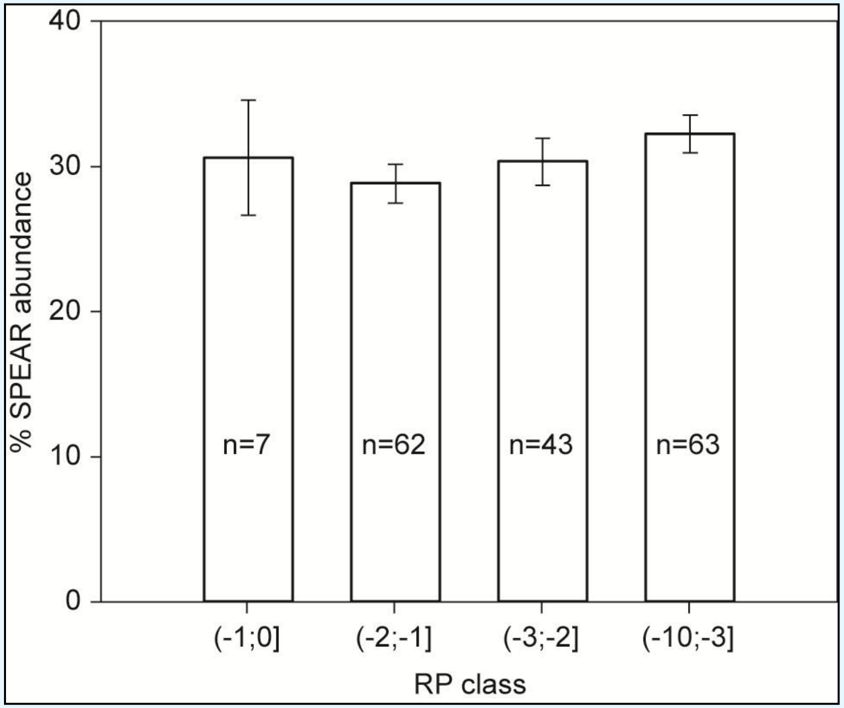


212 sites sampled yearly in 2004-2007

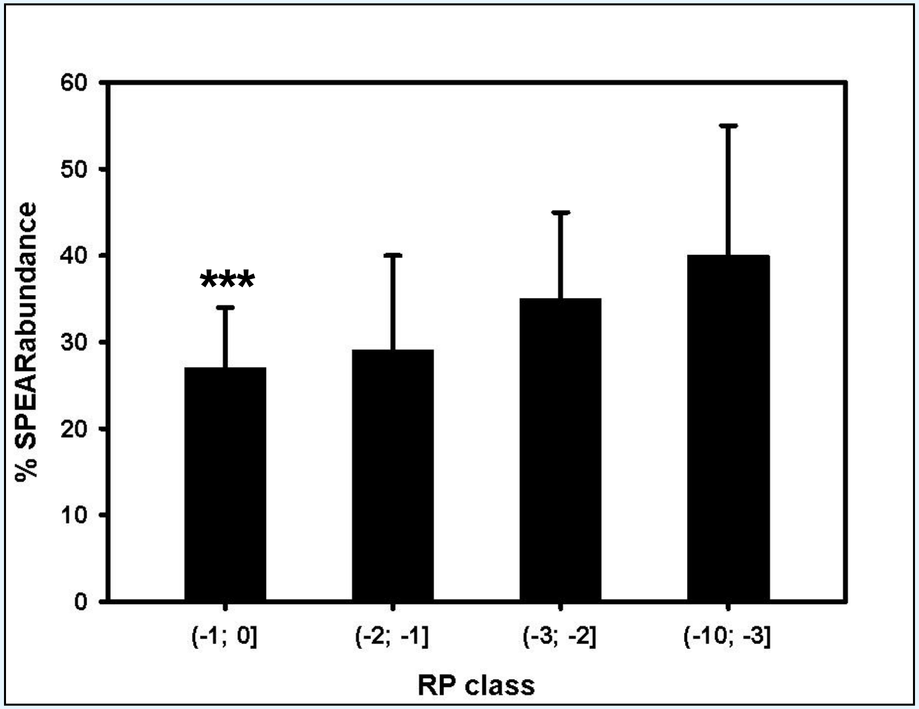
The RP model considers

- **Precipitation events**
- **Soil characteristics**
- **Crop types and growth phases**
- **Agricultural intensity**
- **Field slopes**
- **Applied amounts for a generic compound was set to constant (limited data)**

Impact of predicted pesticide runoff



%SPEAR abundance represents the arithmetic mean of 4 yearly samples from 2004-2007



Modified after Schriever et al., 2007a

IV. The role of physical properties

Parameter	DCA 1	DCA 2
Silt (%)	0.35***	-
Gravel (%)	0.40***	-
Agricultural intensity	0.11*	-
Upstream riparian habitat quality	0.31***	-
Catchment size	-	0.43***
Substrate heterogeneity	-	0.22***

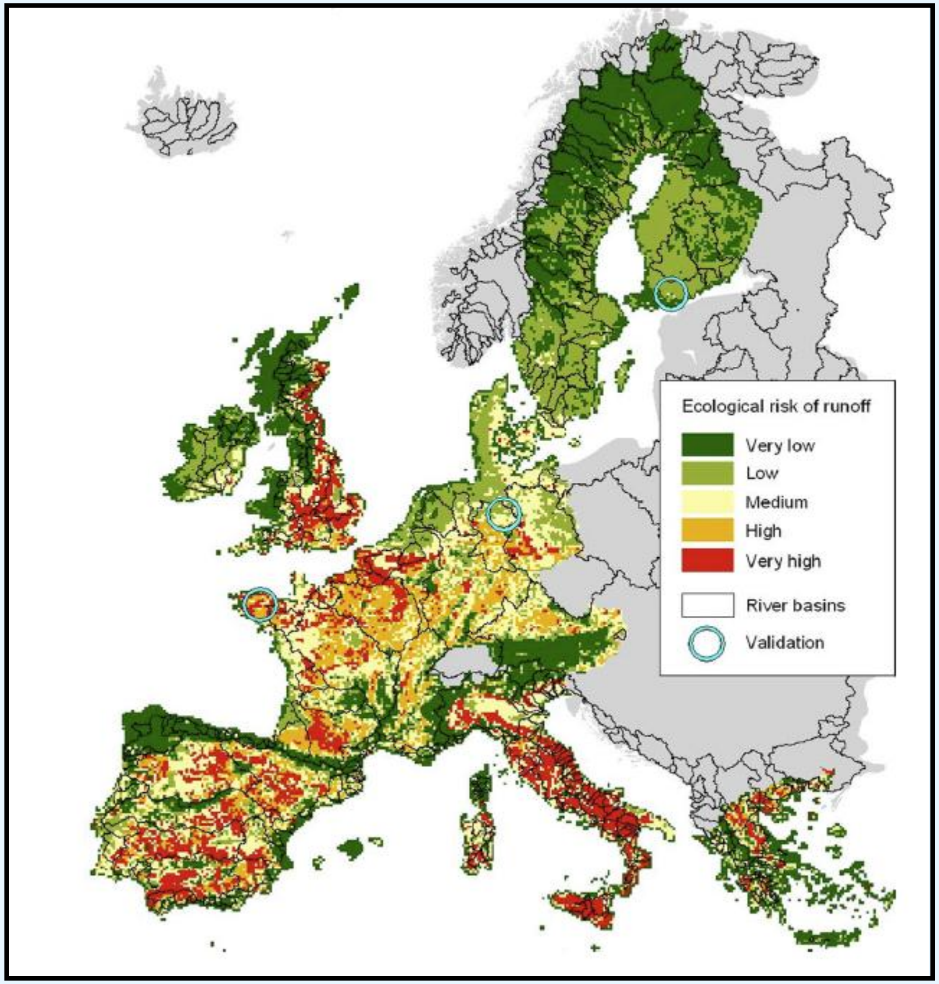
Pearson correlation with DCA ordination axes

*** P<0.05**

***** P<0.001**

V. Confounding factors

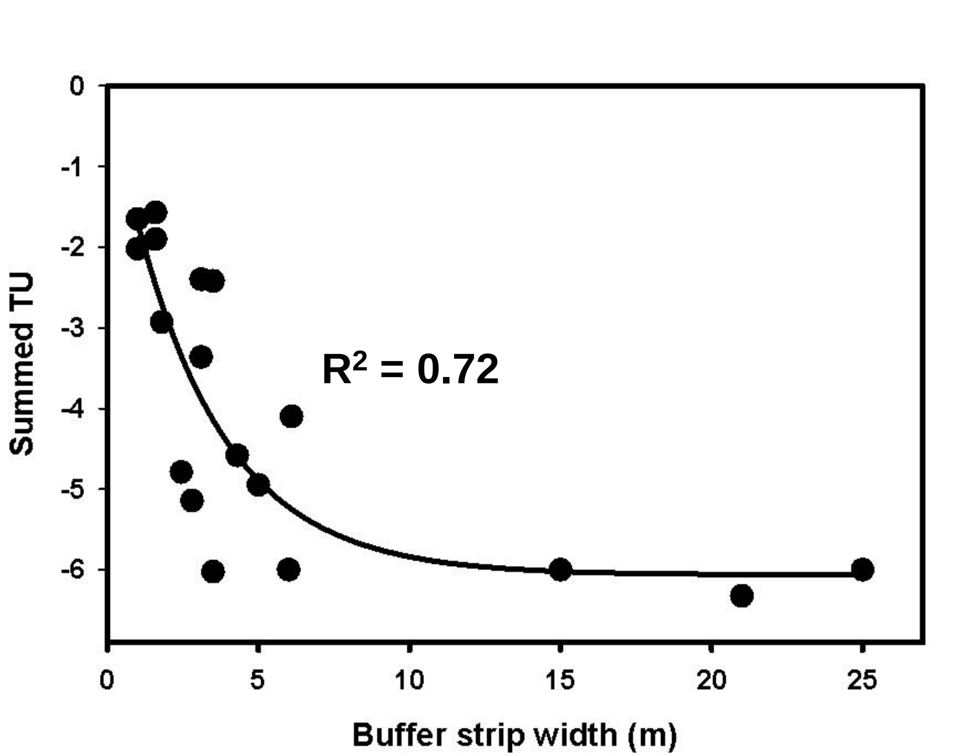
› **Applied amounts of pesticides increase with decreasing latitude – but is not picked up by RP**



Schriever et al., 2007b

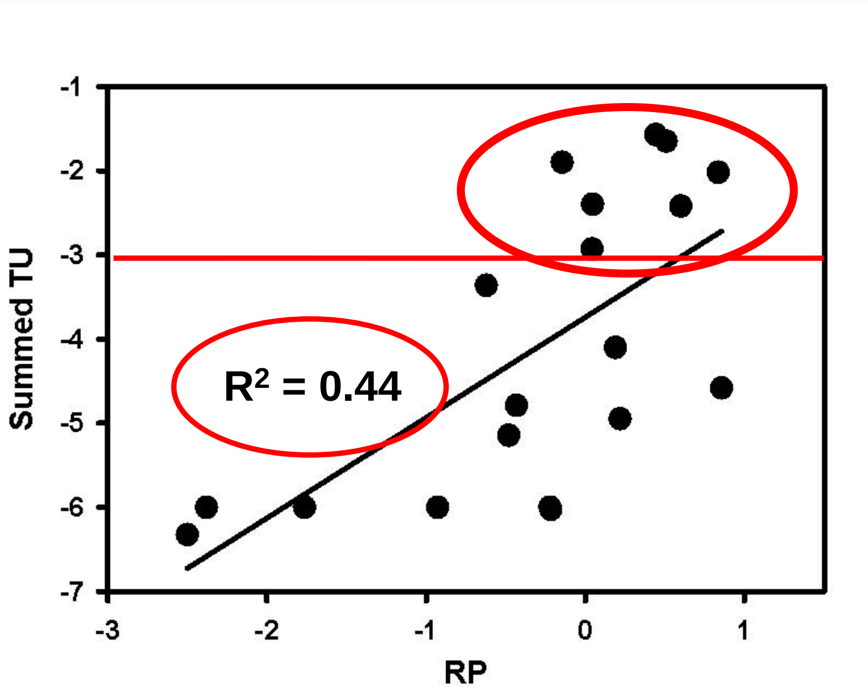
Buffer strips

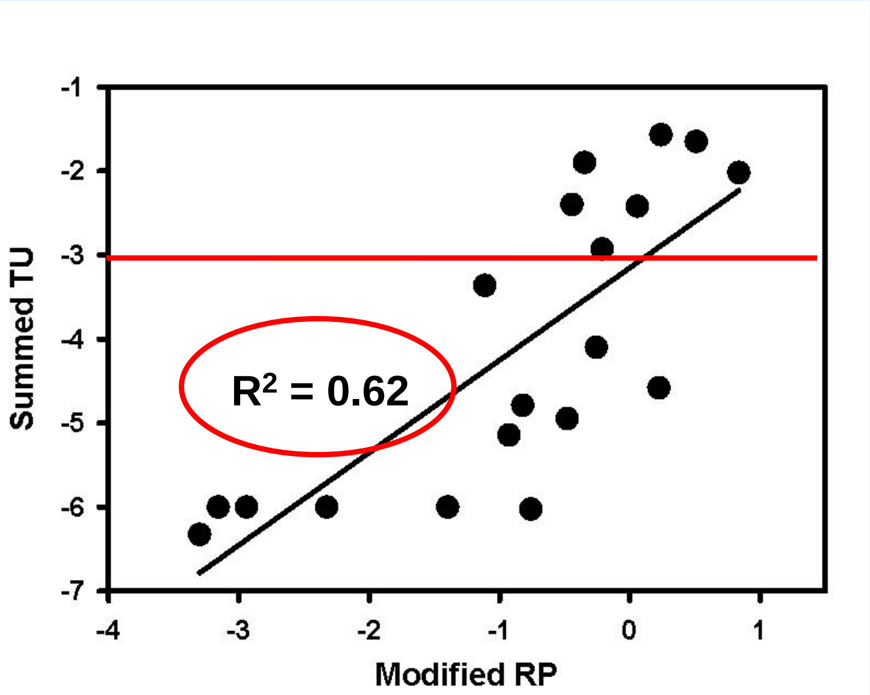
- **Measures of buffer strip retaining capacity are not included in the RP model**
- **Buffer strips are known to retain significant proportions of pesticide runoff**



Field based data from 2009 in 15 Danish low-order streams. Pesticides sampled with event triggered samplers.

Buffer strips and predicted pesticide runoff





Field based data from 2009 in 15 Danish low-order streams. Pesticides sampled with event triggered samplers.

Conclusion

- **Buffer strip characteristics improve predictive power of the RP model – and is tightly coupled to the occurrence and toxicity of agricultural pesticides in DK streams**
- **Despite the presence of buffer strips and relatively low pesticide application rates, the toxicity of found pesticide mixtures still exceed the threshold of expected community change**
- **However, poor physical stream properties can cloud these changes – at least in the absence of extreme events of pesticide contamination**

How do we integrate physical stream properties in the assessment and prediction of risk?