Fate and Behaviour of Pesticides in Farm Ditches

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Overall Objective

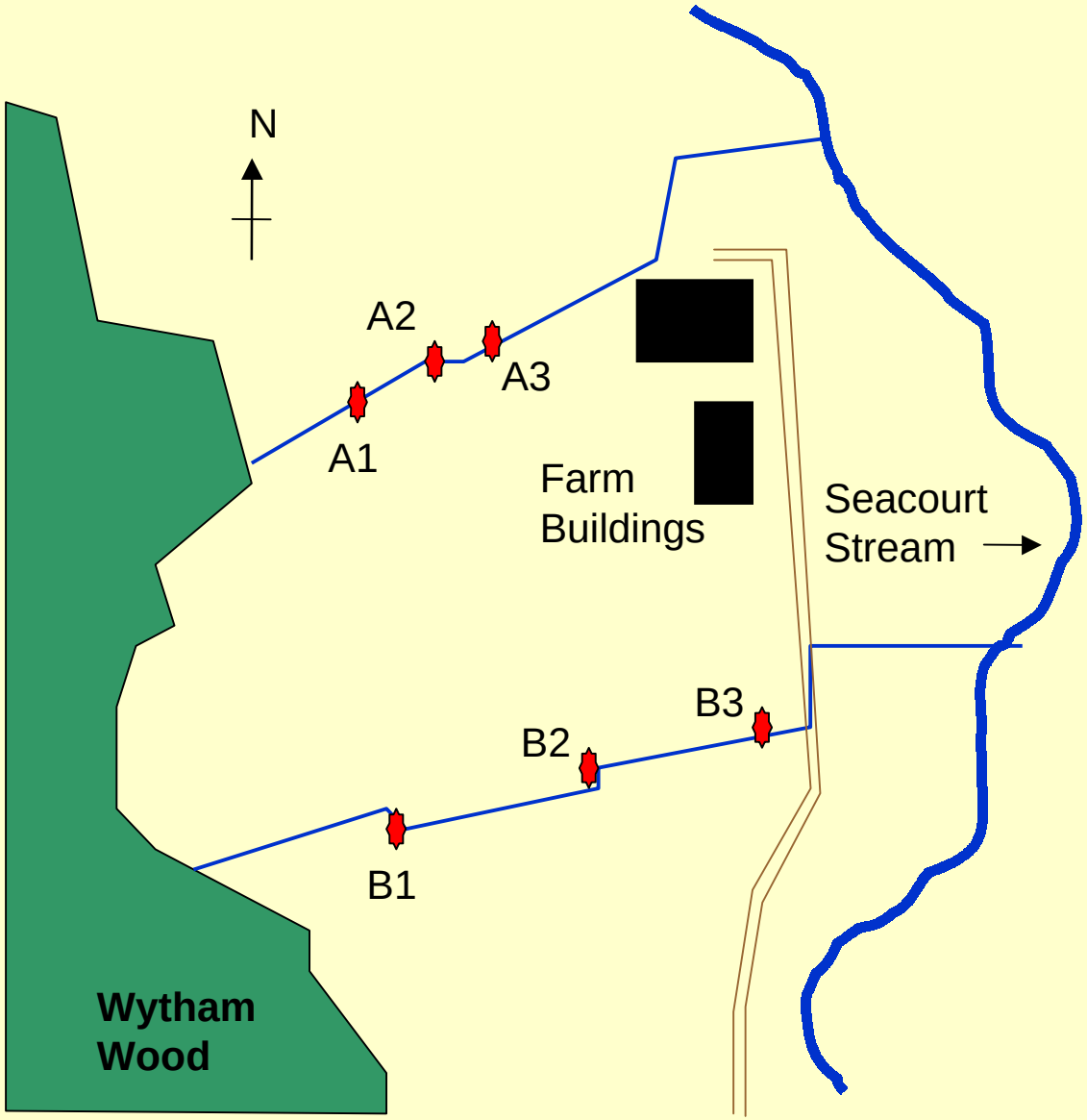
- To assess and model the role of farm ditches in modifying pesticide loads leaving agricultural fields

Why are we interested in Ditches

- We know that normal agricultural use of pesticides results in runoff
- Ditches link fields to the larger river network
- Pesticides loads passing though a ditch may be reduced

Field Site at Wytham, Oxford

- Flow at sites A1, A3, B1 and B3
- Routine grab samples at all sites for pesticides
- Flow event samples at sites A1, A3, B1 and B3 for pesticides



Sampling Site A1

Sampling Site A3

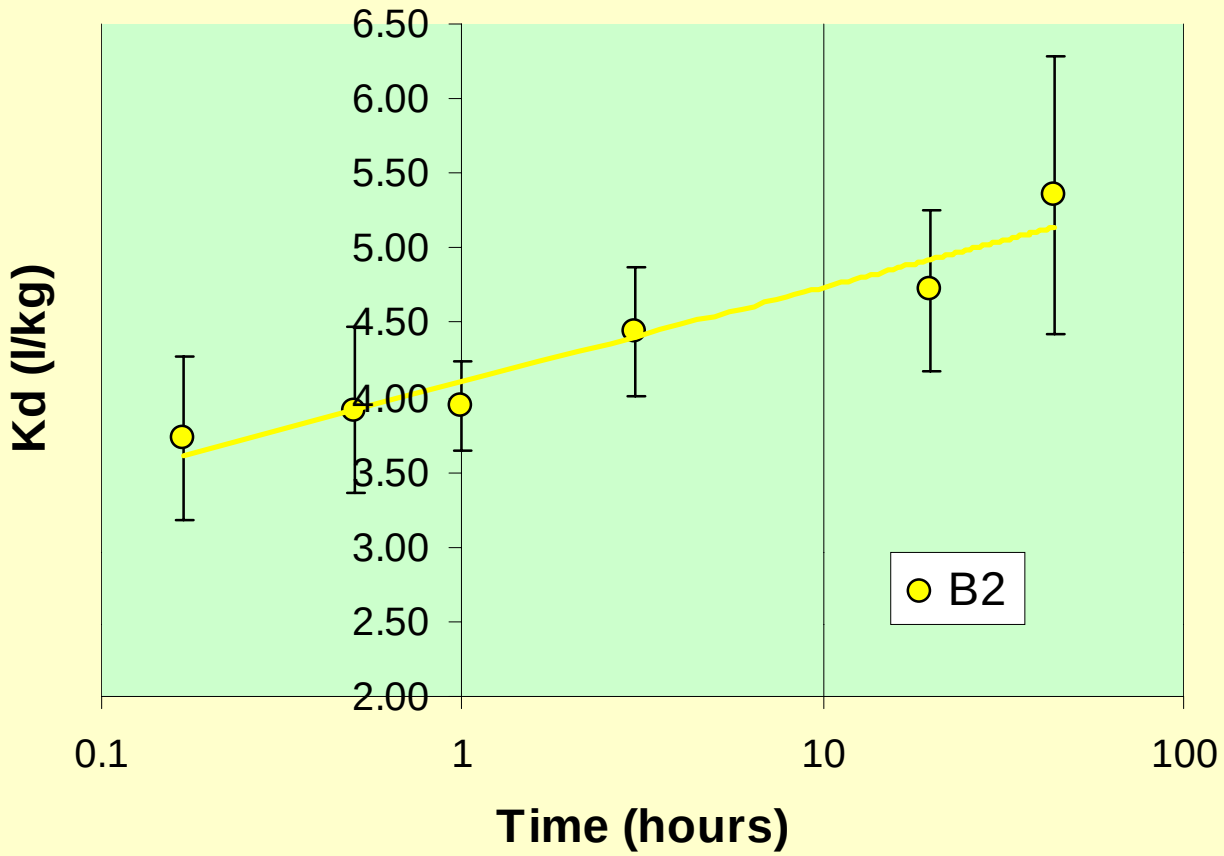
Sampling Site B1

Sampling Site B3

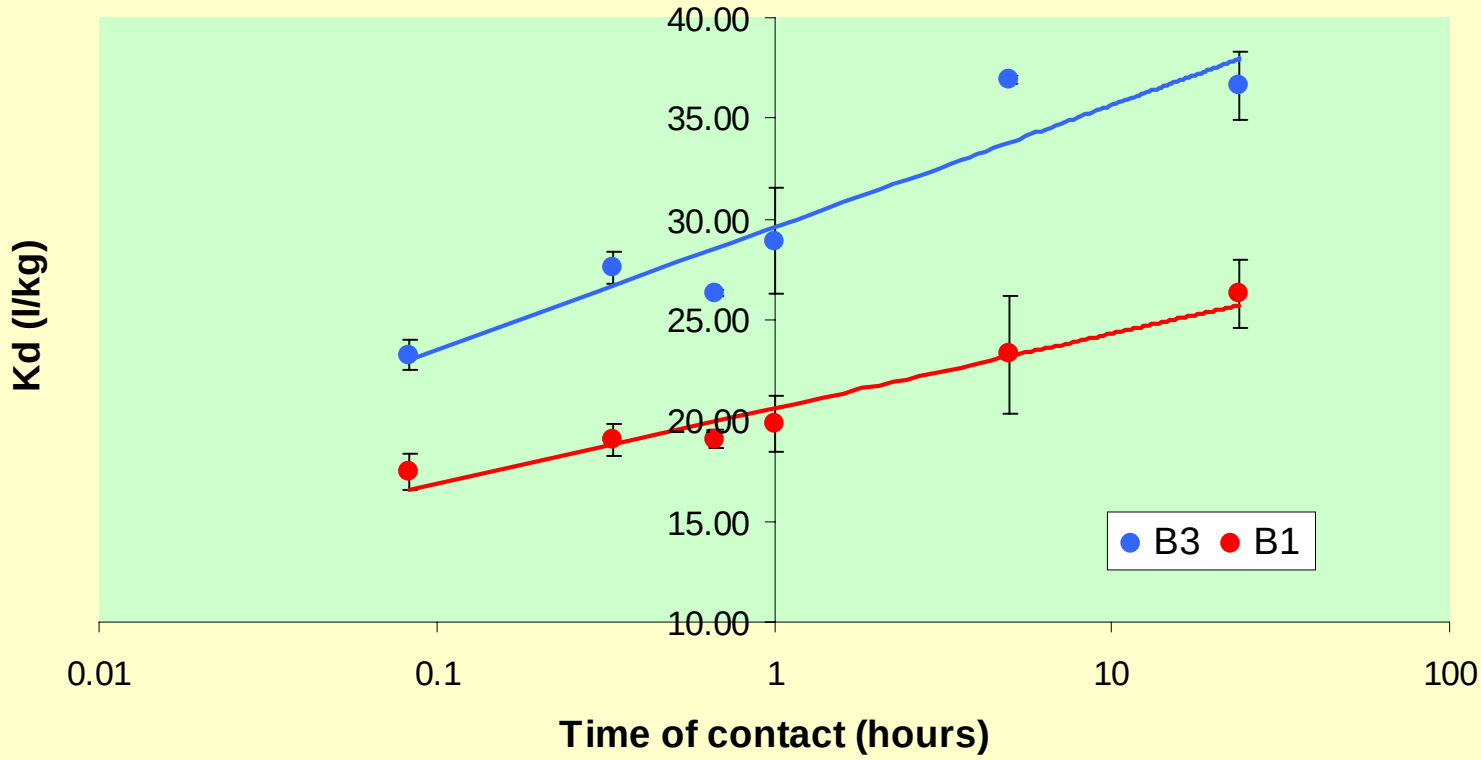
Ditch B

	Isoproturon	Diflufenican
Vapour Pressure (mPa)	0.0033 (20 ºC)	0.07 (30 ºC)
Koc (l/kg)	120	1990
DT50 (soil, days)	12 - 32	175 - 294

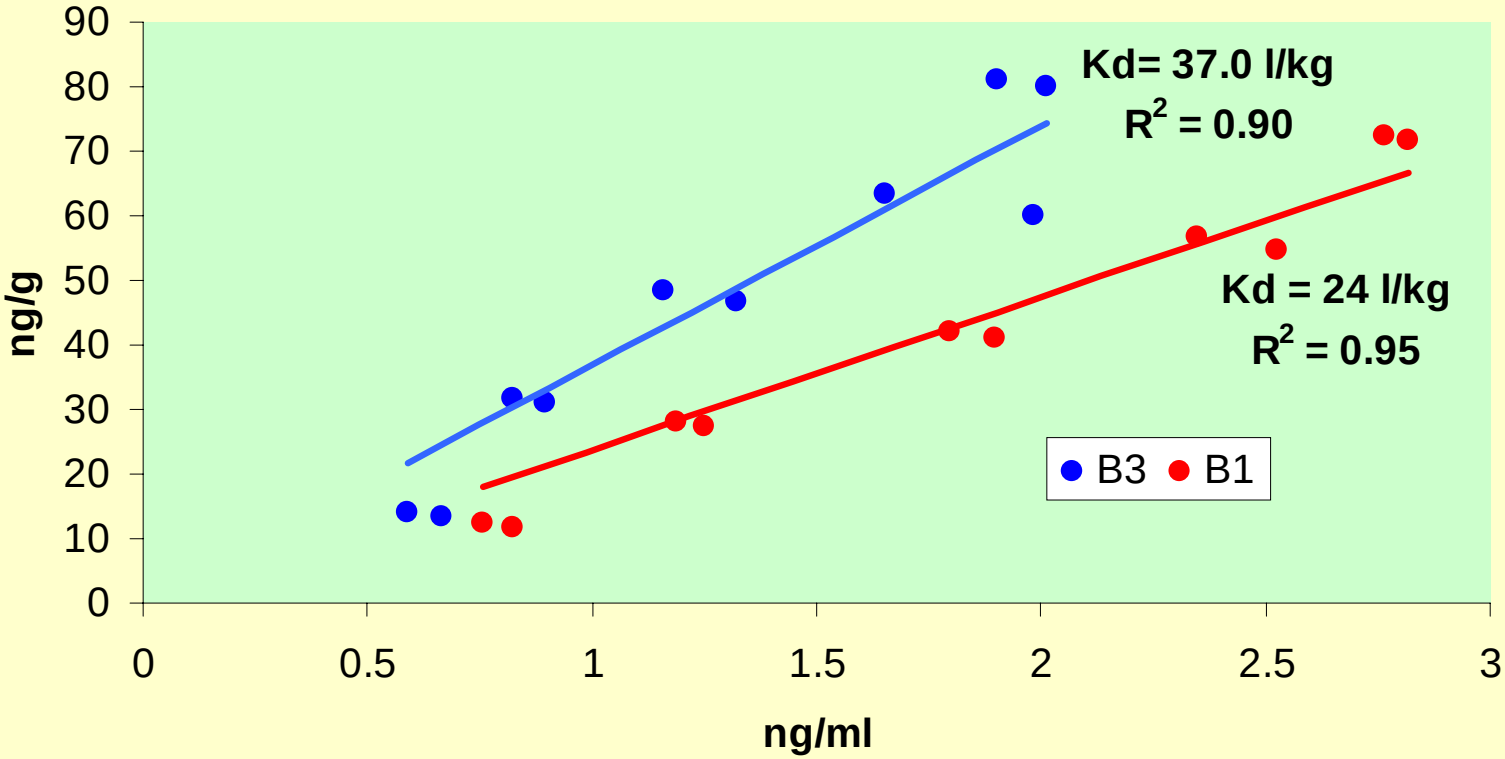
Kinetics of IPU Sorption to Bed Sediments



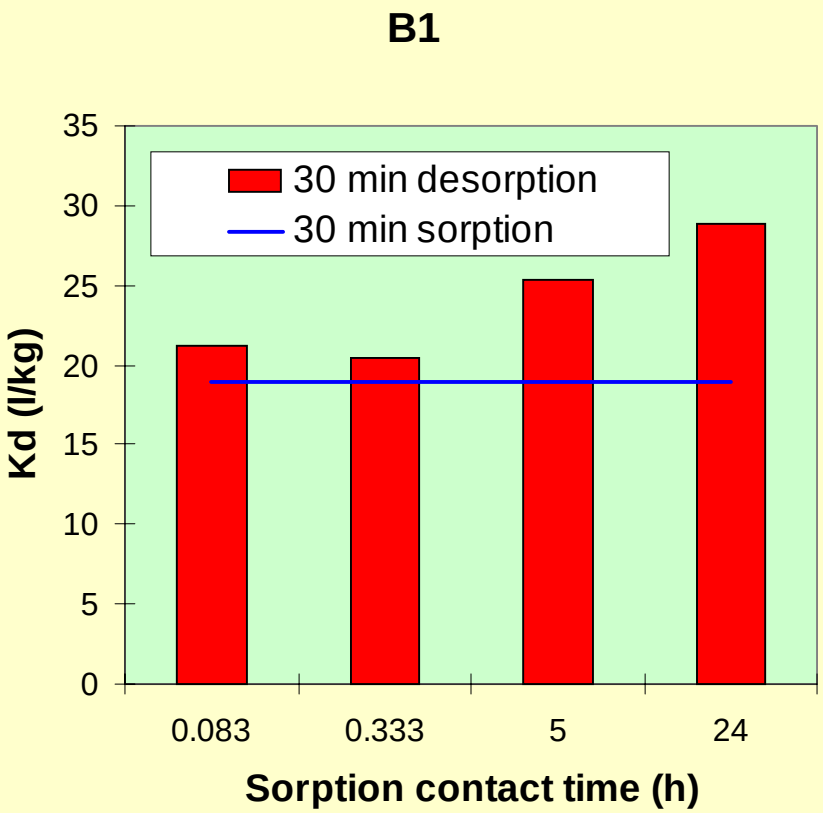
Kinetics of DFF Sorption to Bed Sediments

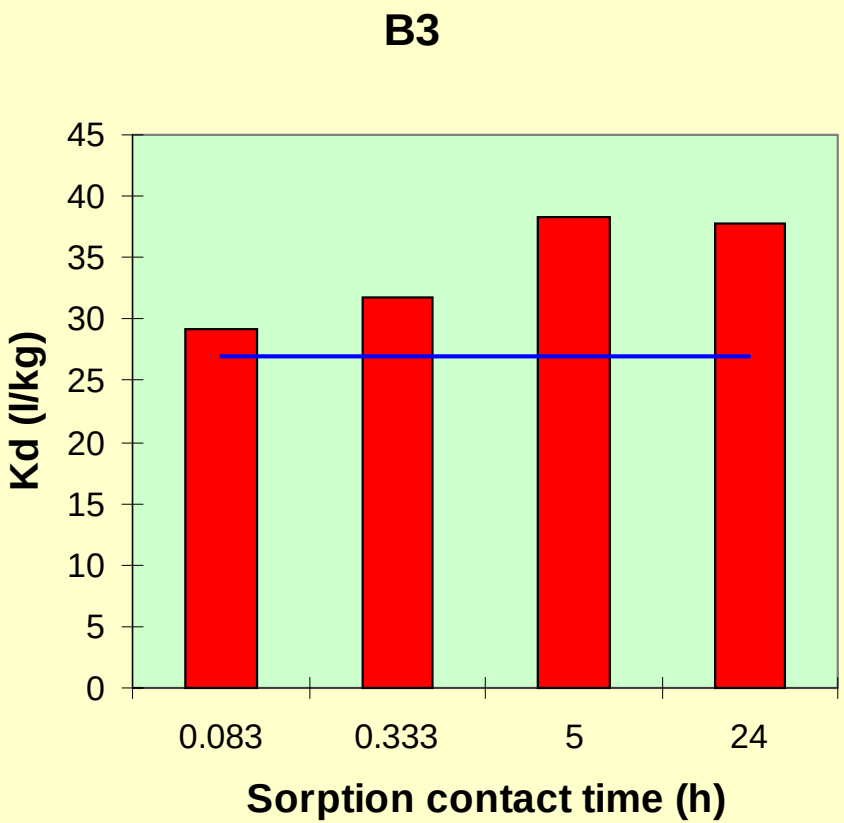


Sorption Isotherms for DFF

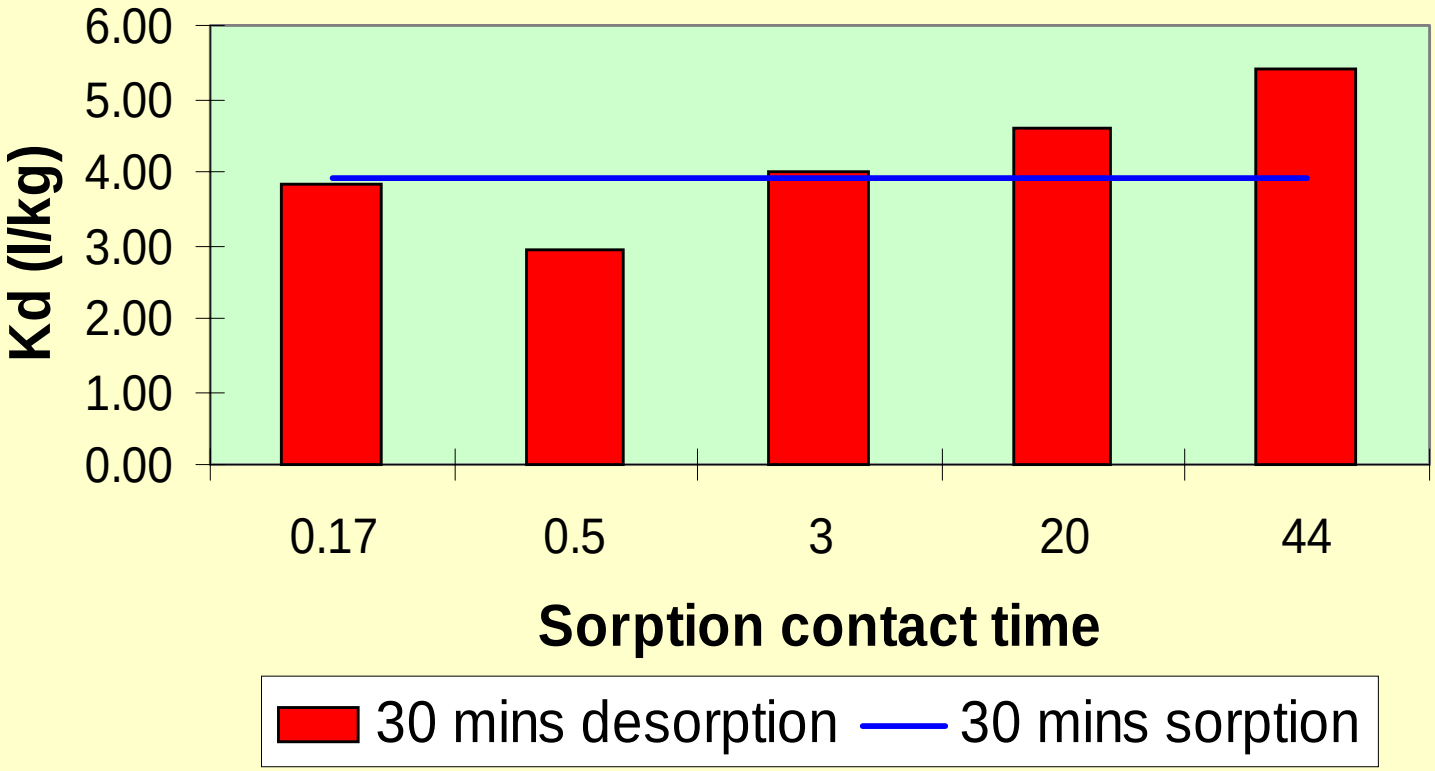


DFF Desorption from Bed sediments





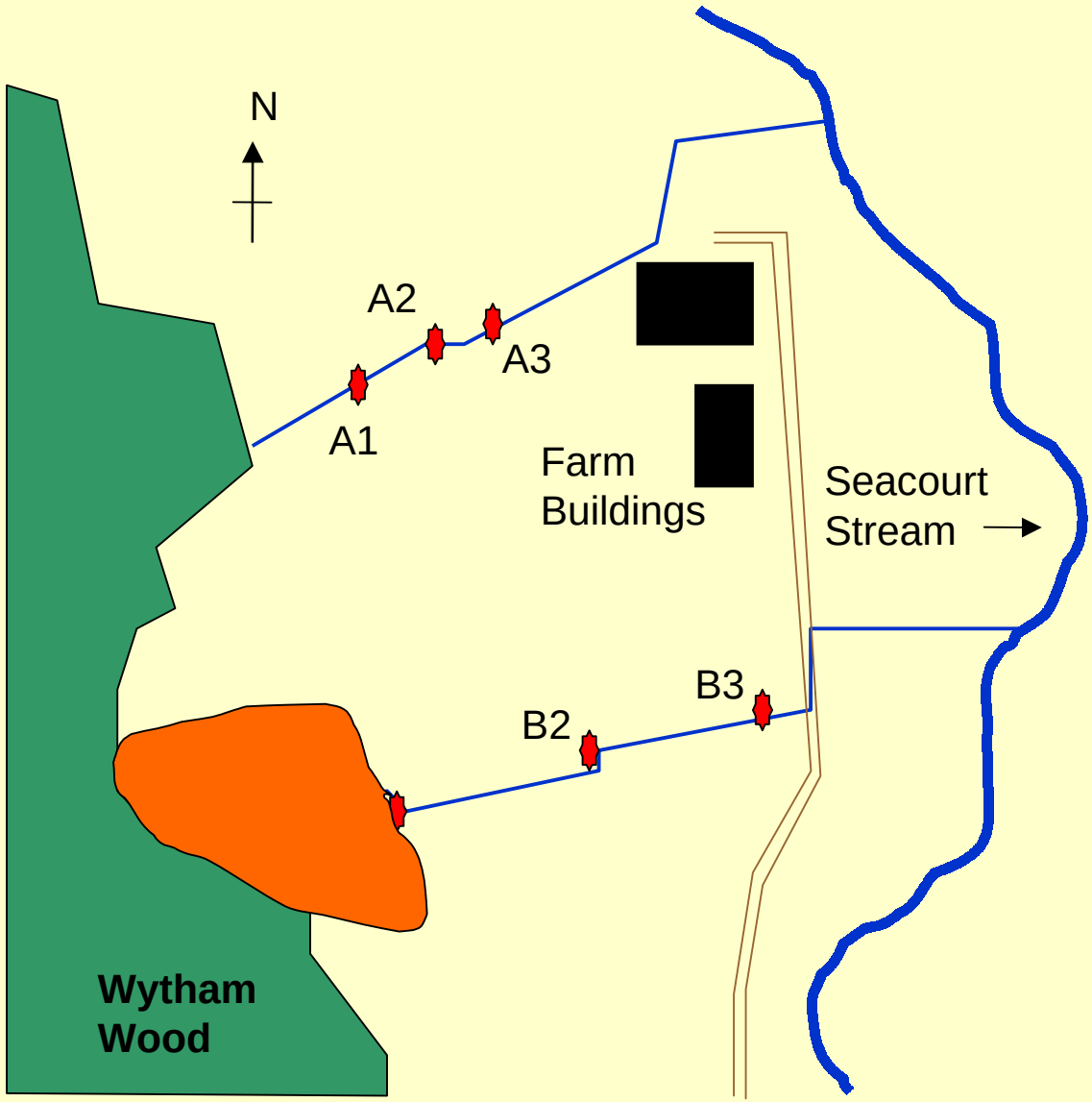
Desorption of IPU from Bed Sediments



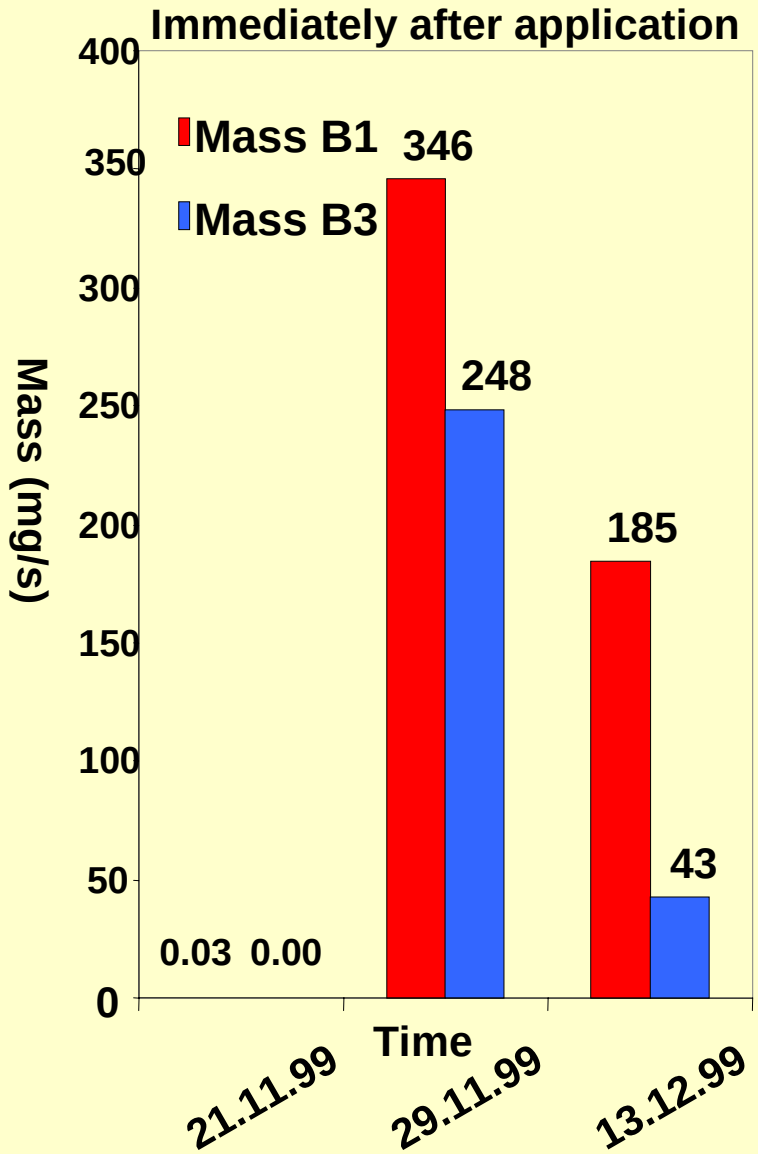
Pesticide Applications

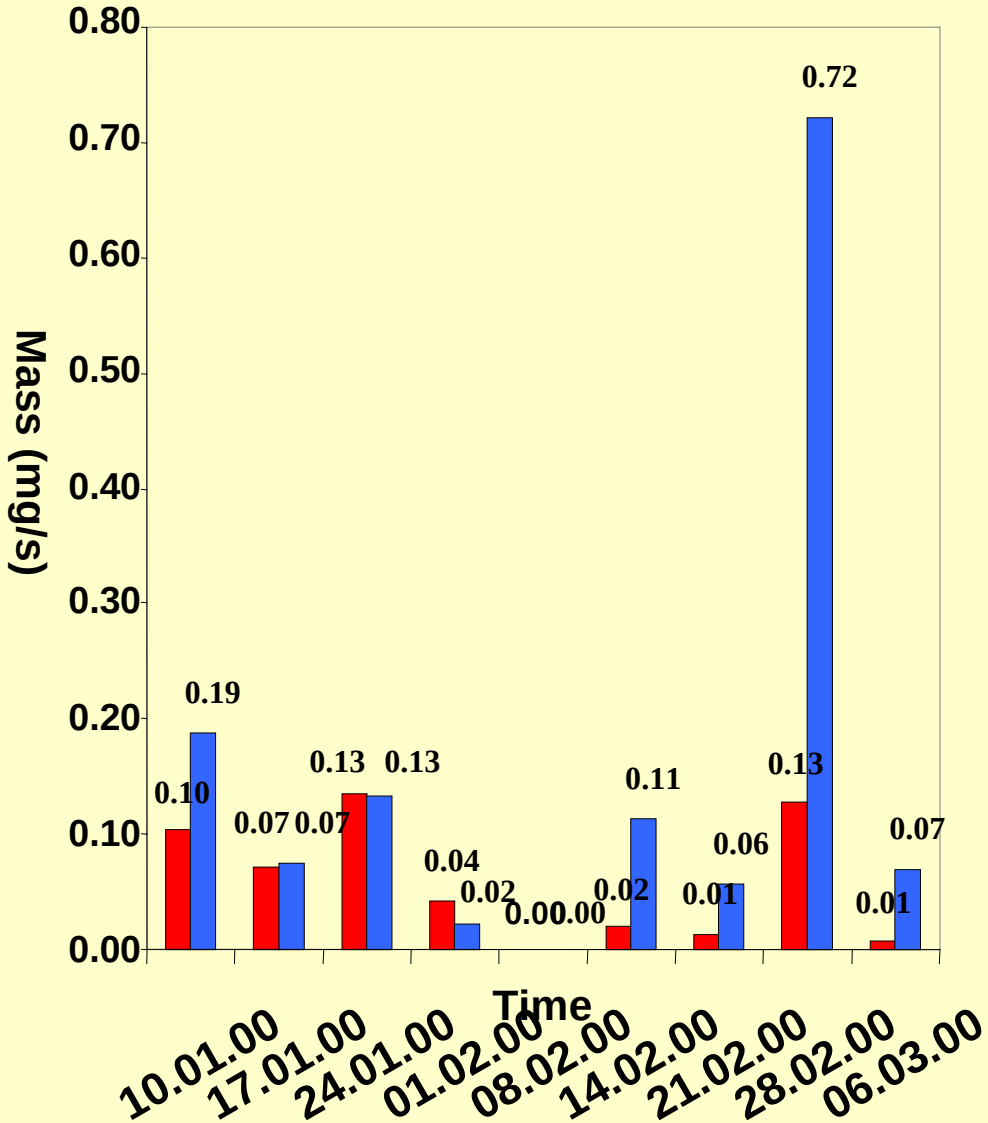
	Date	Rate (kg/ha)
Isoproturon	21/11/1999	1.5
	23/11/1999	0.6
Diflufenican	23/11/1999	0.06

Area Treated



Isoproturon – Manual Samples

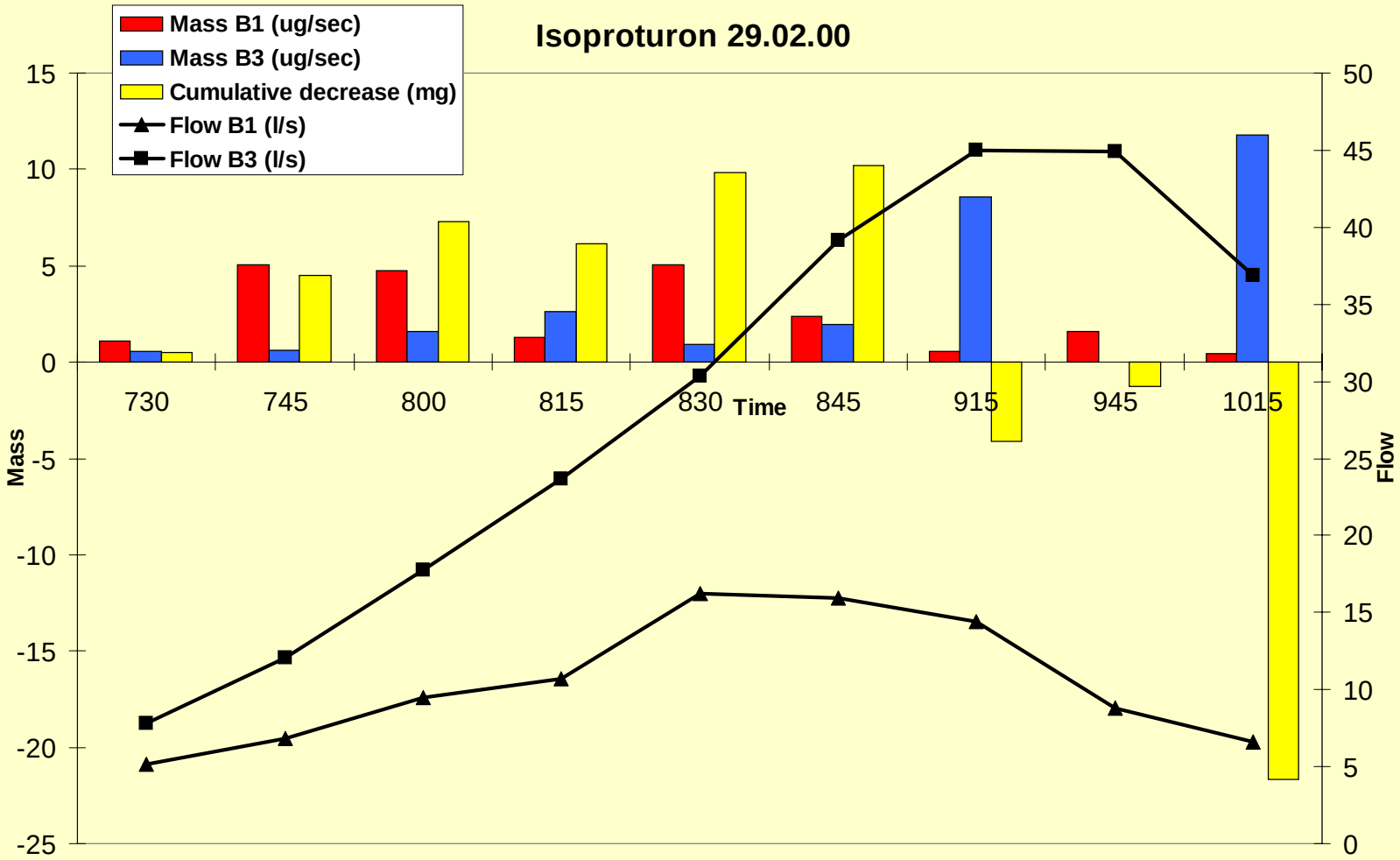




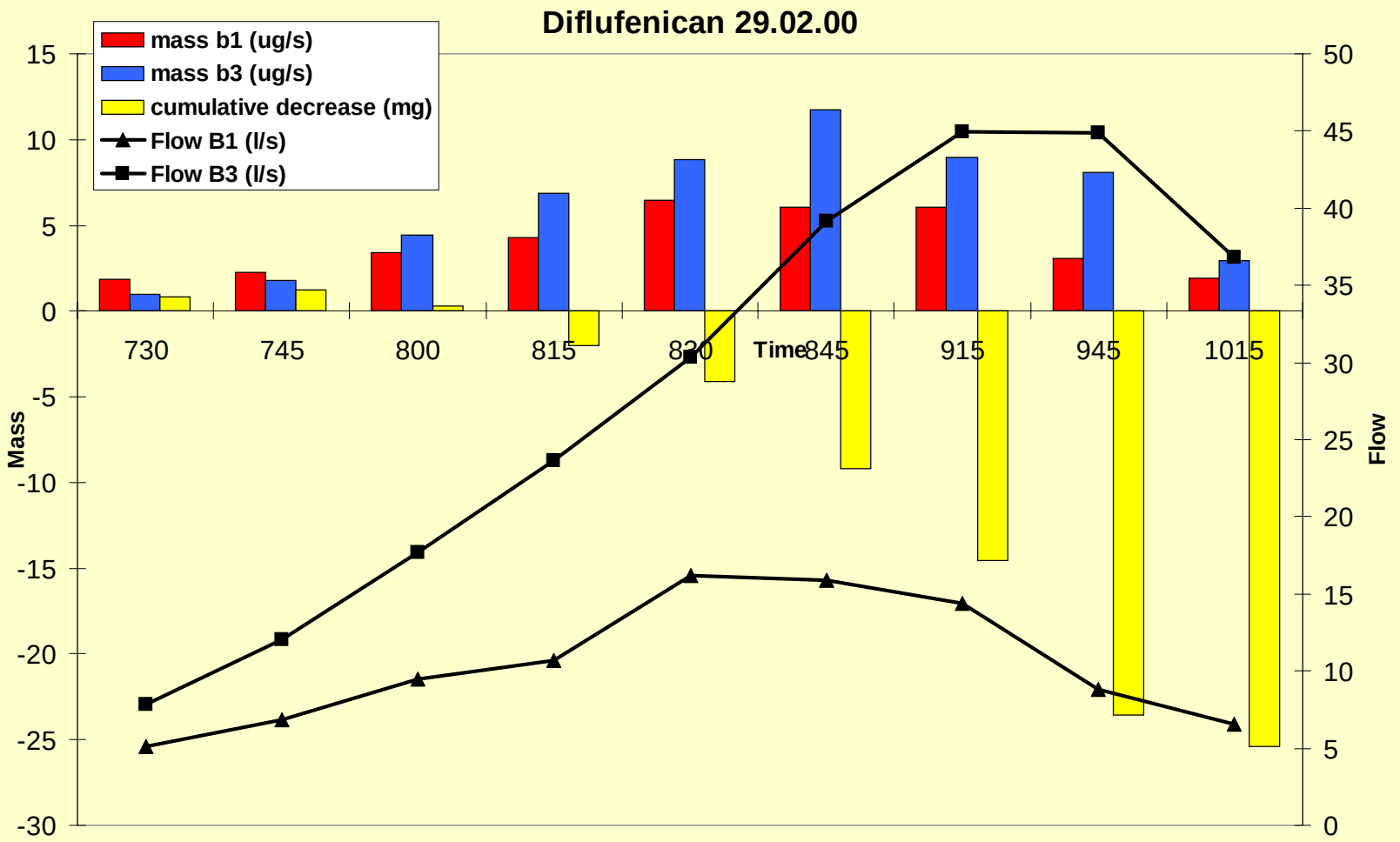
Mass balance for isoproturon and diflufenican Autumn 1999 to Spring 2000

Pesticide	Site	Maximum load (g)	Minimum load (g)
Isoproturon	Top	334	118
	Bottom	129 (61%)	66 (44%)
Diflufenican	Top	2.9	1.0
	Bottom	1.2 (57%)	0.7 (29%)

Isoproturon Runoff Event 29/02/2000



Diflufenican Runoff Event 29/02/2000



Isoproturon Concentrations in Bed Sediments

Date	Site	Sediment Concentration (µg/kg)	Water Concentration (µg/l)	Kd
13/12/2000	B1	303	176.0	1.7
	B2	128	108.0	1.2
	B3	477	17.0	28.1
10/01/2000	B1	140	0.17	823.0
	B2	11	0.28	38
	B3	<10	0.37	---

Diflufenican Concentrations in Bed Sediments

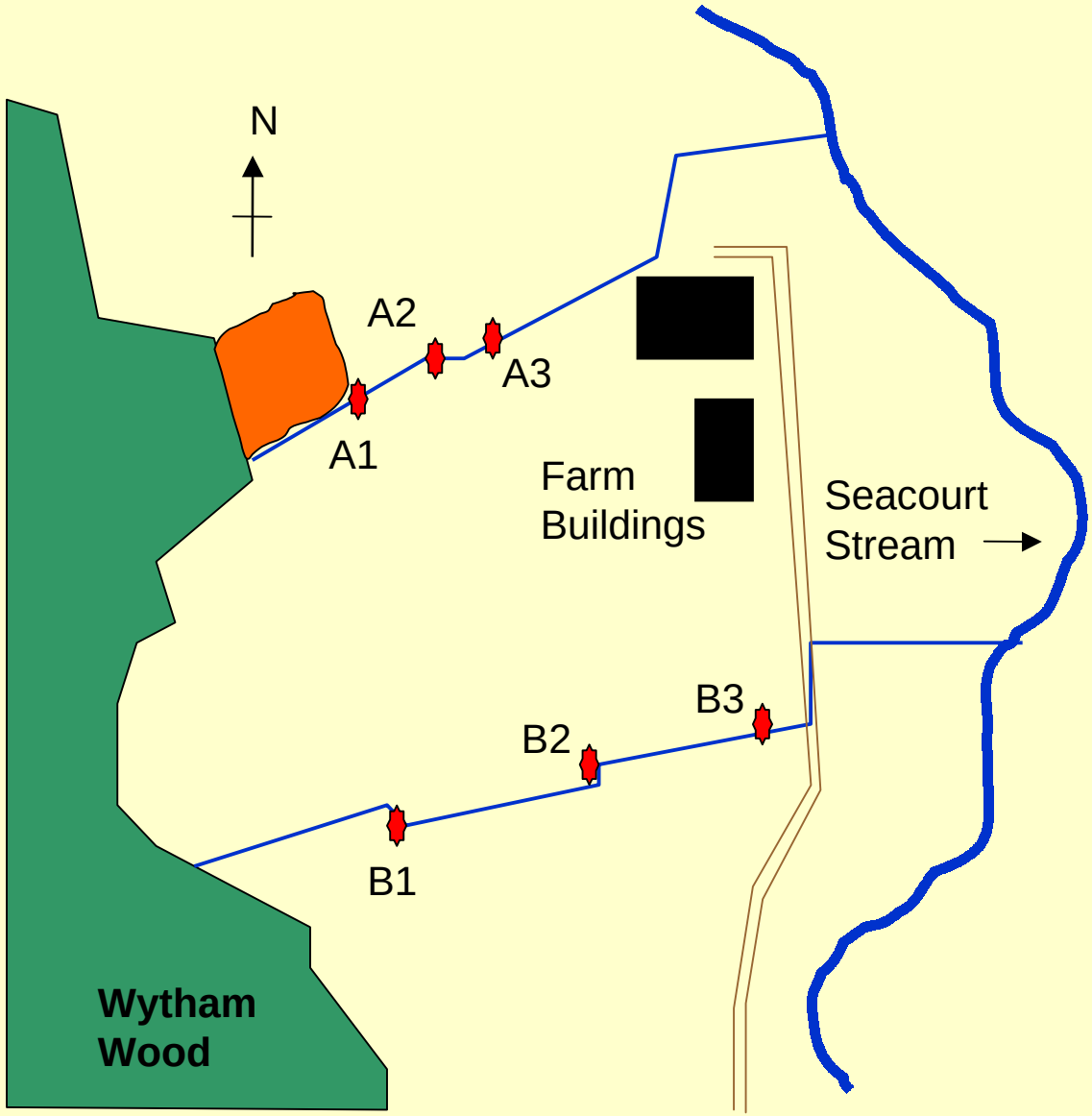
Date	Site	Concentration in sediments (µg/kg)	Concentration in ditch water (µg/l)	Kd
13/12/1999	B1	1642	1.58	1039
	B2	44	0.85	52
	B3	113	0.15	750
10/01/2000	B1	350	<0.02	----
	B2	310	0.02	1585
	B3	<10	<0.02	----

Ditch A

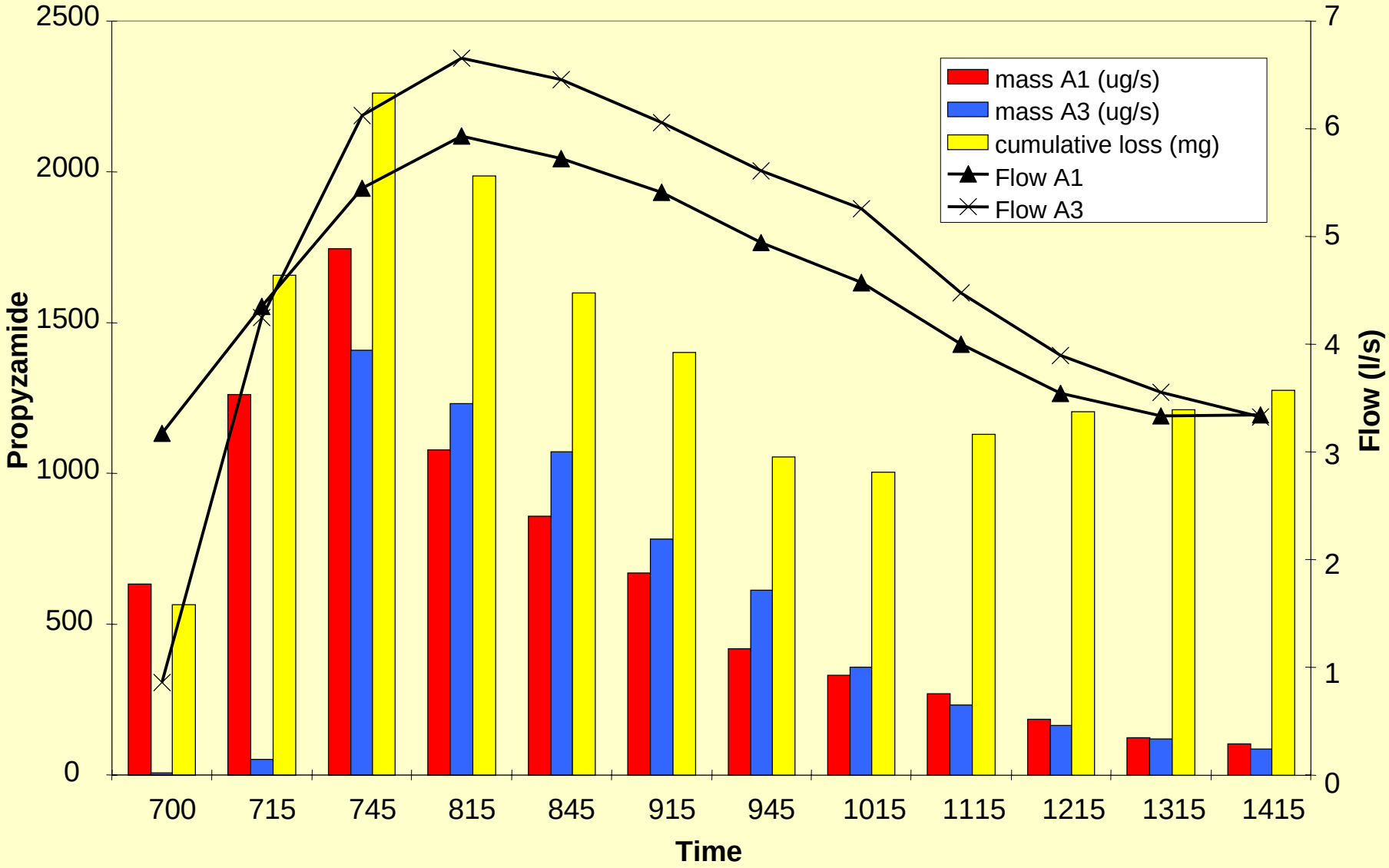
	Propyzamide
Vapour Pressure (mPa)	0.058 (25 ºC)
Koc (l/kg)	800
DT50 (soil, days)	21 - 90

Application: 26/10/2000 1.4 kg/ha

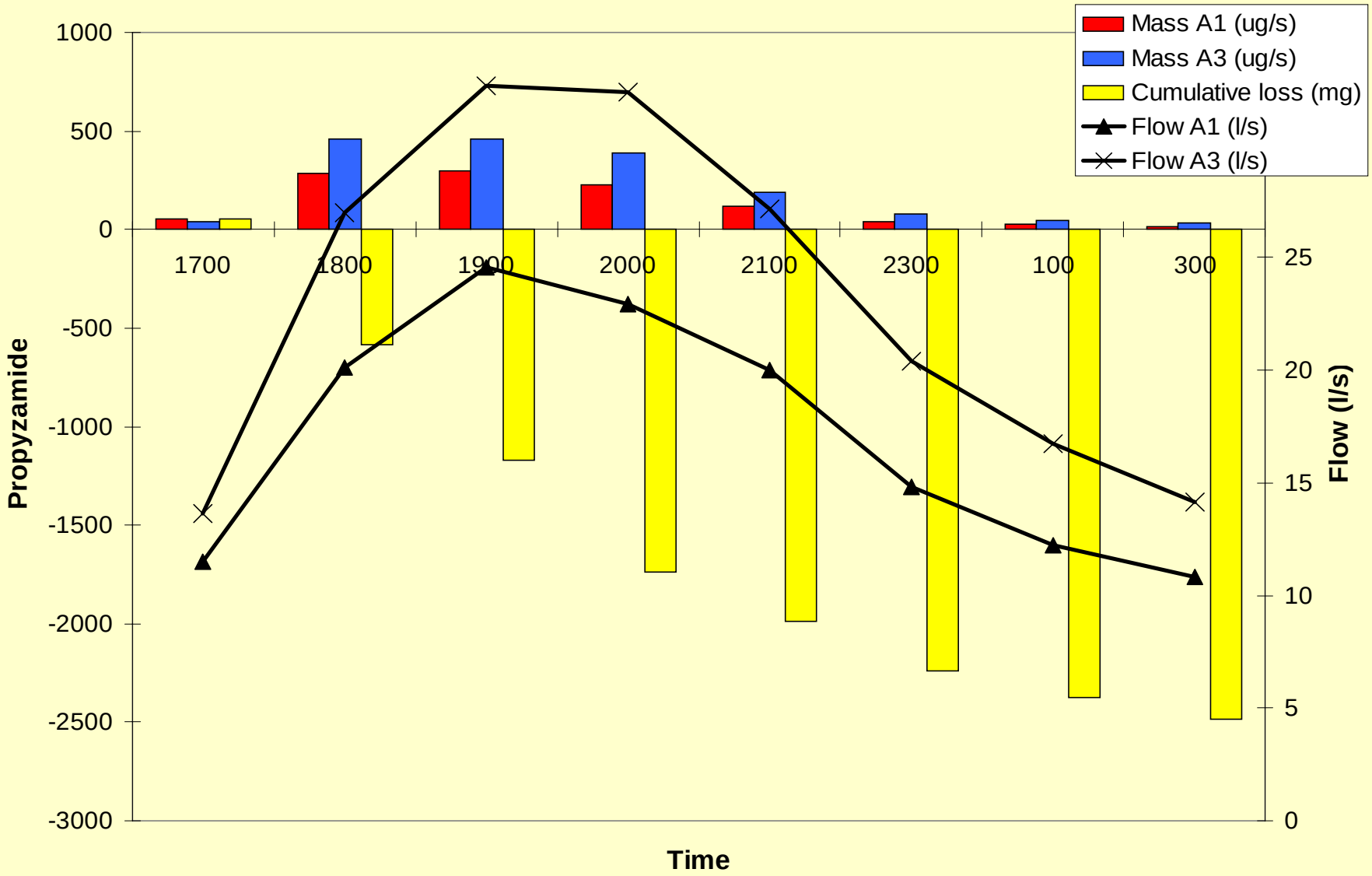
Area Treated



Propyzamide Runoff Event 28/10/2000



Propyzamide Runoff Event 2/11/2000



Summary of 5 Runoff Events for Propyzamide

Date	Mass at Top (g)	Mass at Bottom (g)	Loss/(gain) (g)
28/10/2000	13.3	12.1	1.2
29/10/2000	13.9	13.2	0.7
31/10/2000	0.8	0.9	(0.1)
2/11/2000	4.1	6.6	(2.5)
11/11/2000	6.4	6.5	(0.1)
Total	38.5	39.3	(0.8)

Conclusions - 1

- Isoproturon and Diflufenican were lost in the ditch (~30 - 60%)
- The most likely process is sorption followed by degradation
- Largest loss by sorption seems to occur in water samples taken shortly after application when water concentrations are high
- Later on there is scope for desorption of previously sorbed pesticide

Conclusions - 2

- Propyzamide event data shows loss of pesticide in early events and release in later events
- Overall there was no net loss of pesticide in first 5 events collected over 2 weeks
- Further event and routine samples have yet to be analysed