Prospects for use of PestSurf catchment scenarios in the Danish pesticide registration
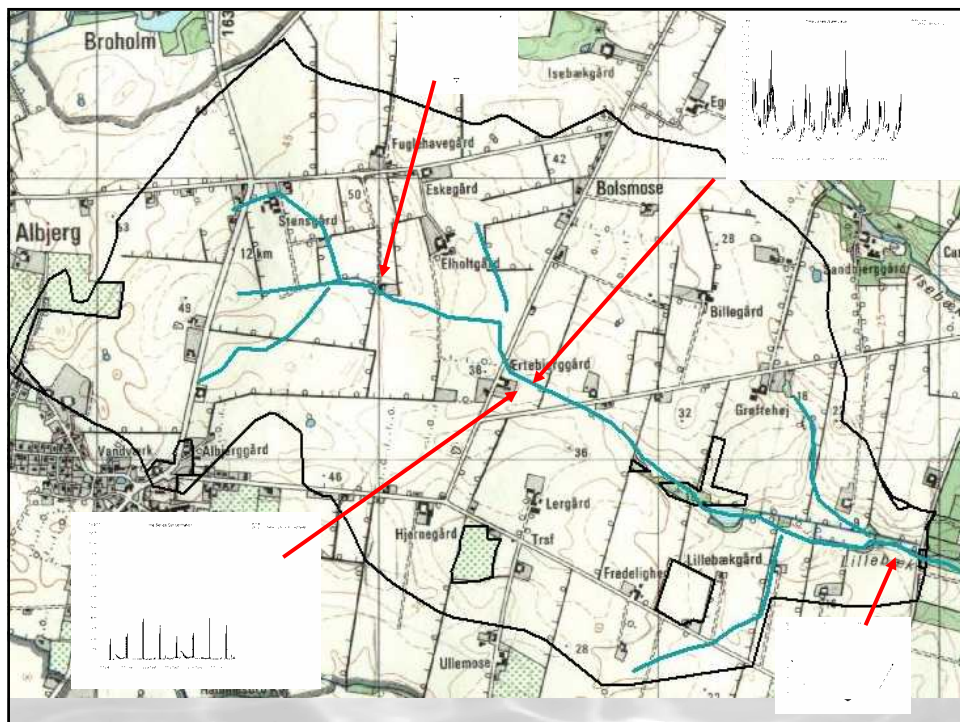
Merete Styczen (DHI) and

Alf Aagaard (DEPA)

Background - PestSurf

- Model system build 1998-2003 on request for the Danish EPA

- Includes 2 streams and 2 ponds – the streams are based on two existing monitoring catchments of about 4.5 and 11 km^2.

- The catchments represent sandy and sandy loam (moraine) conditions respectively

PestSurf

- Includes root zone, 3D groundwater and stream
- Distributed input with respect to land use, soil types, buffer zones etc.
- Main output is flow and concentrations in the stream (but concentrations in root zone, drains and groundwater can be extracted)
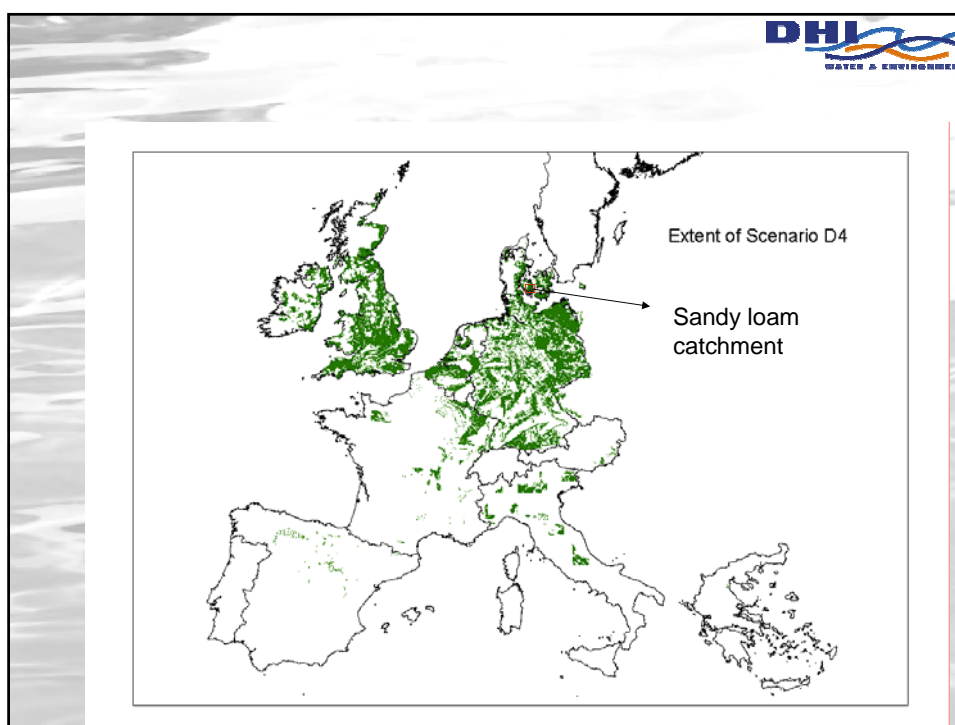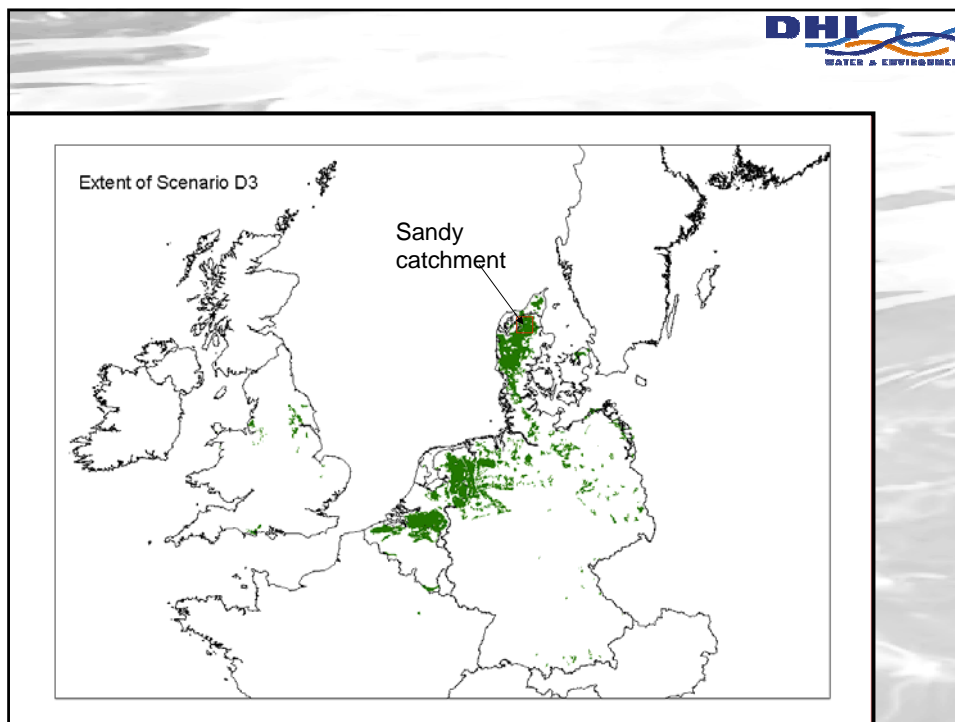
Objective of study

- To clarify the possibilities and limitations of the PestSurf system by calculation of concentrations for 12 pesticides (alpha-cypermethrin, bentazon, bromoxynil, fluazinam, malathion, metamitron, pendimethalin, propiconazol,, prosulfocarb, rimsulfuron, terbutylazin and tribenuron-methyl) in 54 scenarios, and

- Comparing them to relevant FOCUS SW-scenarios for the same compounds.

Relevant comparisons

- PestSurf sandy loam stream ~ D4-stream
- PestSurf sandy loam pond ~ D4 pond
- PestSurf sandy stream ~ D3 ditch
- PestSurf sandy pond ~ D3 ditch

Extent of Scenario D3

Sandy
catchment

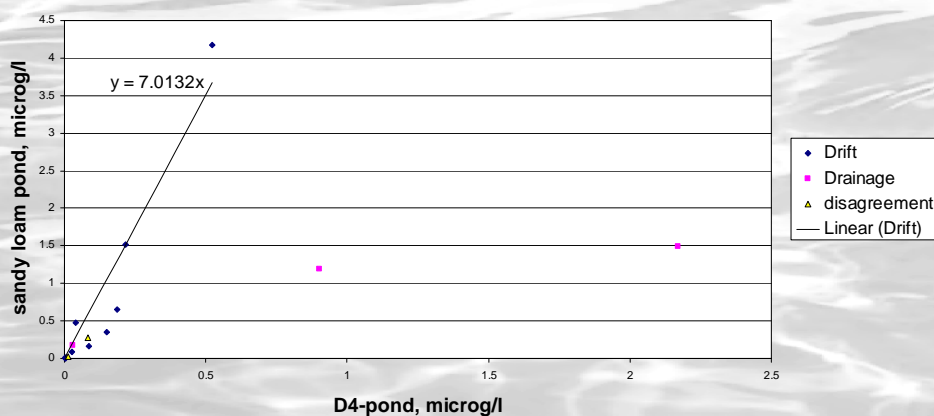Extent of Scenario D4

Sandy loam
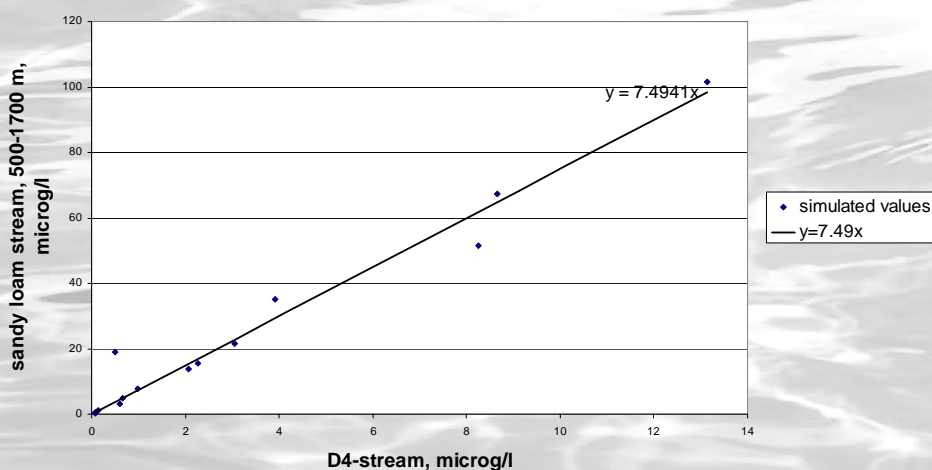catchment

Major differences in approaches

- Area relationships (catchment/stream)
- Natural cross sections of stream
- Varying water level
- 4 years simulation period
- Macrophytes
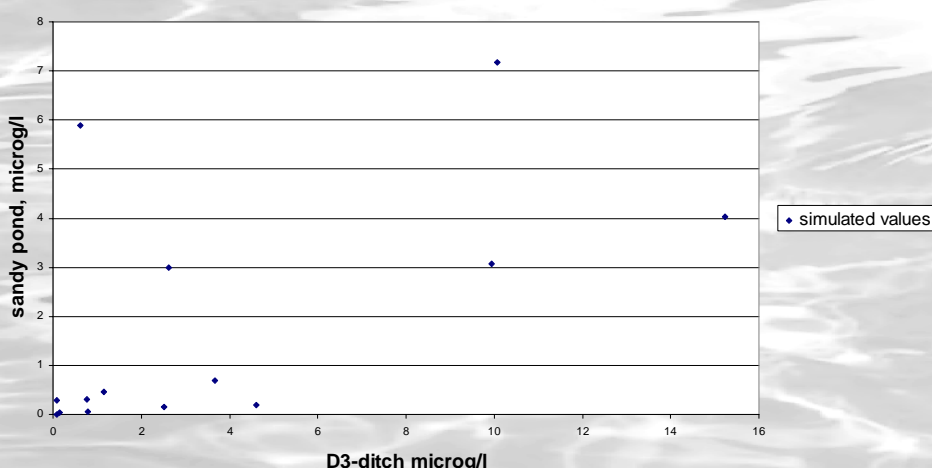- Groundwater may transport pesticide to stream and pond

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Sandy loam pond ~ D4 pond

comparison of model results
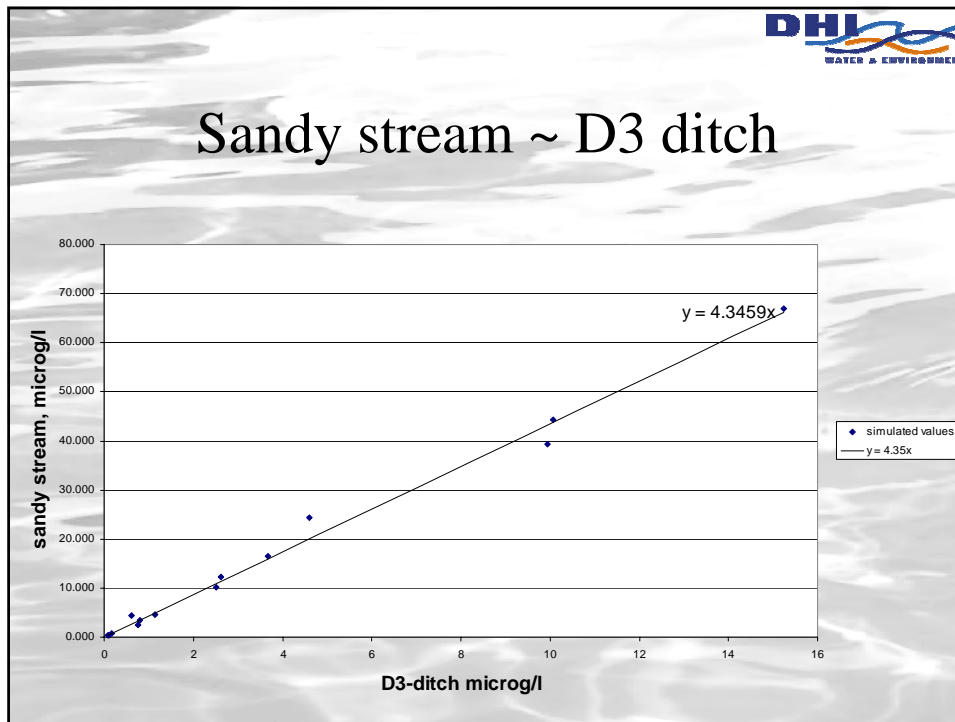
$y = 7.0132x$

Legend:
- ♦ Drift
- ■ Drainage
- △ disagreement
- — Linear (Drift)

y-axis: **sandy loam pond, microg/l** (0 to 4.5)
x-axis: **D4-pond, microg/l** (0 to 2.5)

Sandy loam stream ~ D4 stream

Sandy pond ~ D3 ditch

Sandy stream ~ D3 ditch
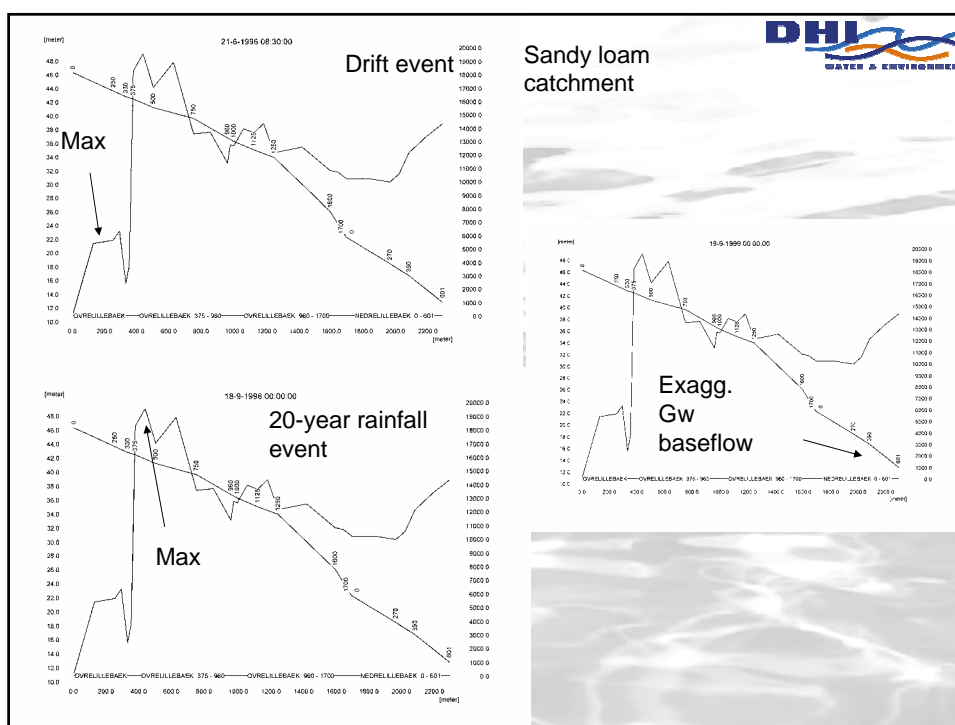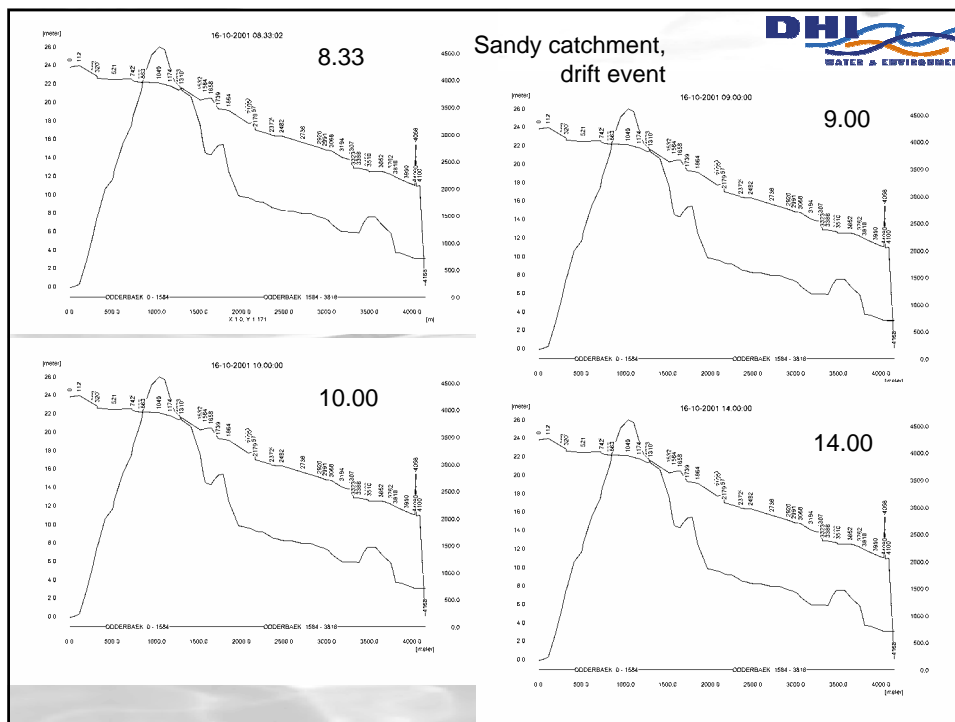

Source of high concentrations

- For all FOCUS stream and ditch simulations, drift is the most important source of high concentrations.
- The same is the case in the sandy stream, but not for all compounds in the sandy loam stream
- We regard the PestSurf drift application is exaggerated (all agr. land, 30 min)

Sandy catchment, drift event

8.33 — 9.00 — 10.00 — 14.00

Drift event — Sandy loam catchment

Max

20-year rainfall event

Max

Exagg. Gw baseflow

Practical problems

- Different pattern required for drift application
- Definition of cutoff criteria: The selected toxicity concentration must not be exceeded for > x minutes in y meter stream length.
- And practical considerations such as "potatoes on all fields in a catchment 8 years in a row"?

Prospects for use

Still under discussion – should have been finalised on 16th March.

- Will require changes to the drift application to some sort of stocastic approach, perhaps including a probability of wind direction.
- Selected stretches will be evaluated – "dry sections" avoided.
- Probabilistic approach: Pulses (acute - hours/chronic - days) may exceed the toxicity levels (acute/chronic) in x simulation points of the stream for max y hours during the simulation period.
- - and max ?half of the exceedances must take place within a year?

Ongoing improvements

- Improved description of colloid transport
- 2-D considerations of the rootzone – mainly of interest for colloids – to distinguish between drainflow and recharge to groundwater.