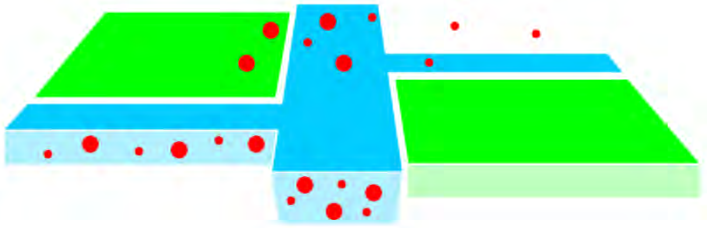
CASCADE – TOXSWA



ASSESSMENT OF PESTICIDE EXPOSURE CONCENTRATIONS IN A SMALL CATCHMENT USING THE CASCADE-TOXSWA MODEL

Erik van den Berg, Mechteld ter Horst, Wim Beltman, Paulien Adriaanse, Jos Boesten, Jan Groenwold en Roel Kruijne

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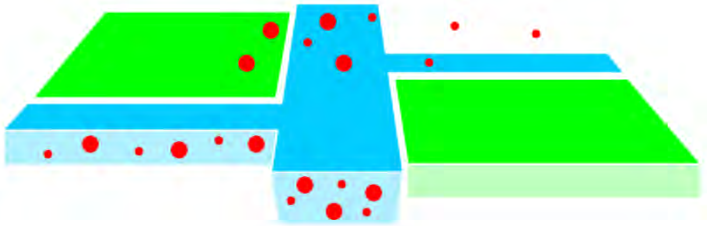
CASCADE – TOXSWA



Introduction

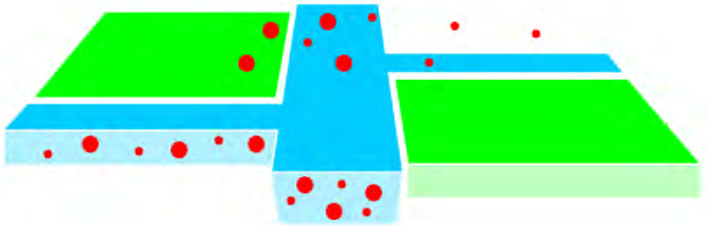
• Quality of surface water needs to be assessed within EU-Water Framework Directive

• Exposure concentrations of plant protection products (PPP) may be relevant at the catchment scale

• Development of model to assess the fate of a PPP in an interconnected system of watercourses

• First results using the new model CASCADE_TOXSWA

CASCADE – TOXSWA

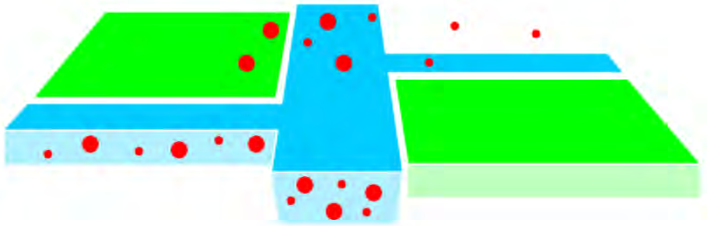


CASCADE-TOXSWA: α-version

- Transport of plant protection products in series of interconnected water courses in agricultural area
- Loading due to deposition via drift
- Parametrisation example area in NE of the Netherlands

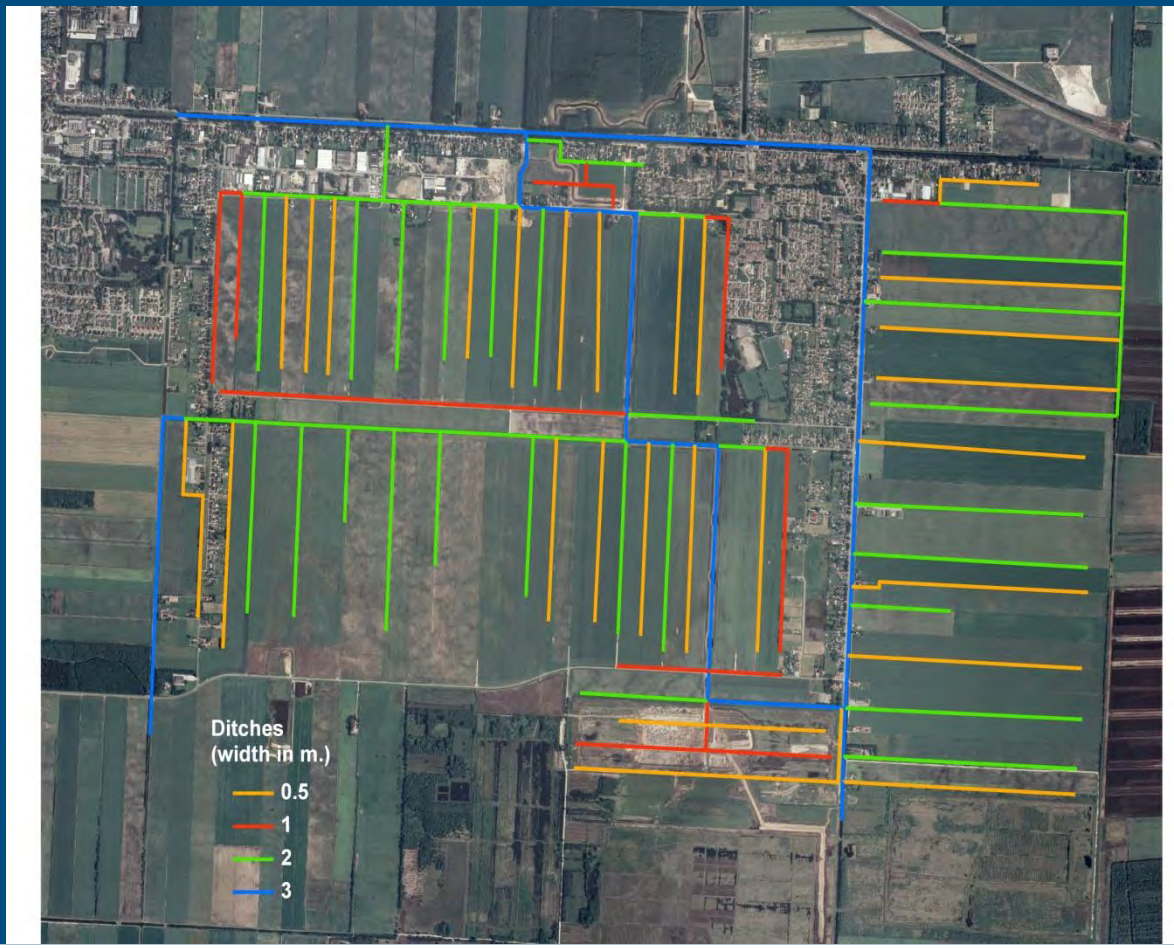
- Limitations:
  - no sediment compartiment

CASCADE – TOXSWA



CASCADE Example area:

Klazienaveen-Zwartemeer, NL



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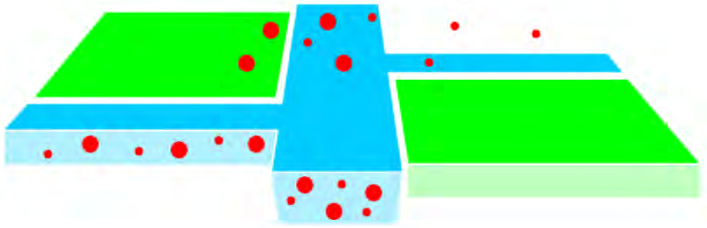


Hydrology CASCADE example area

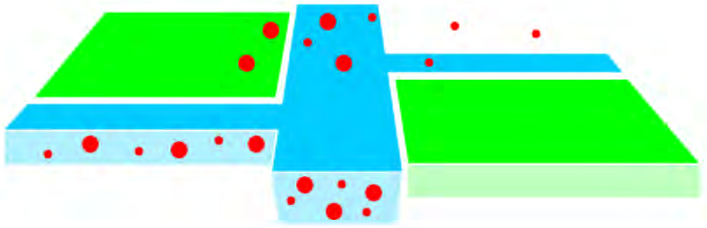
- Area with water level controlled by weirs and pumps

- Calculations with hydraulic model SWQN

- Area with 137 water courses; bottom width of water courses varies between 0.5 and 3 m. Total length of watercourses in area 64 km.

- crops: grass, sugarbeet, potatoes, cereals

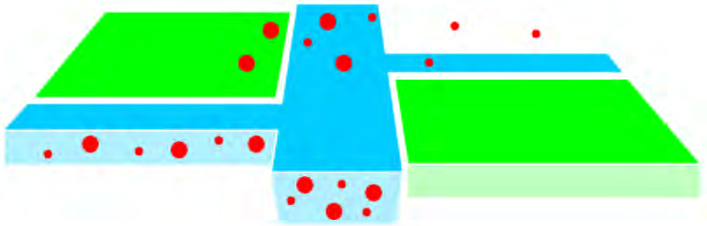
CASCADE – TOXSWA

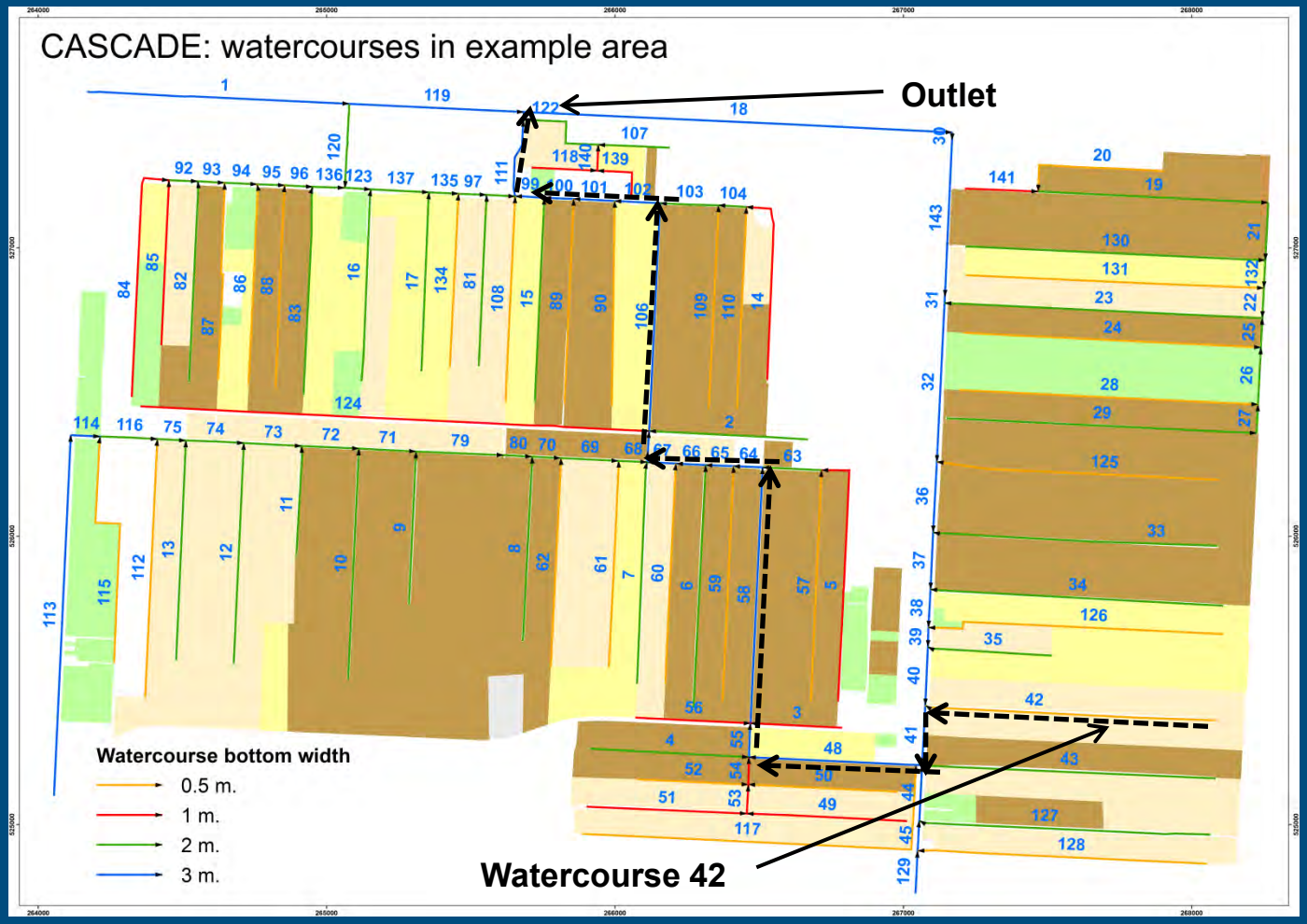


CASCADE run 1

- Period with high discharge rates (August - November 1993)
- Loading watercourse with tracer on 2 August 1993, length water course 1010 m
- Concentration patterns at three locations in the area (site of application, halfway to outlet and at outlet)

CASCADE – TOXSWA





Loading on 2 August in watercourse 42

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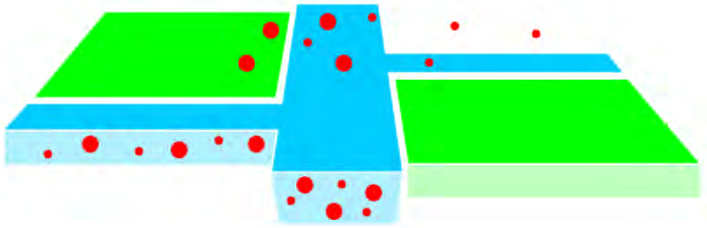
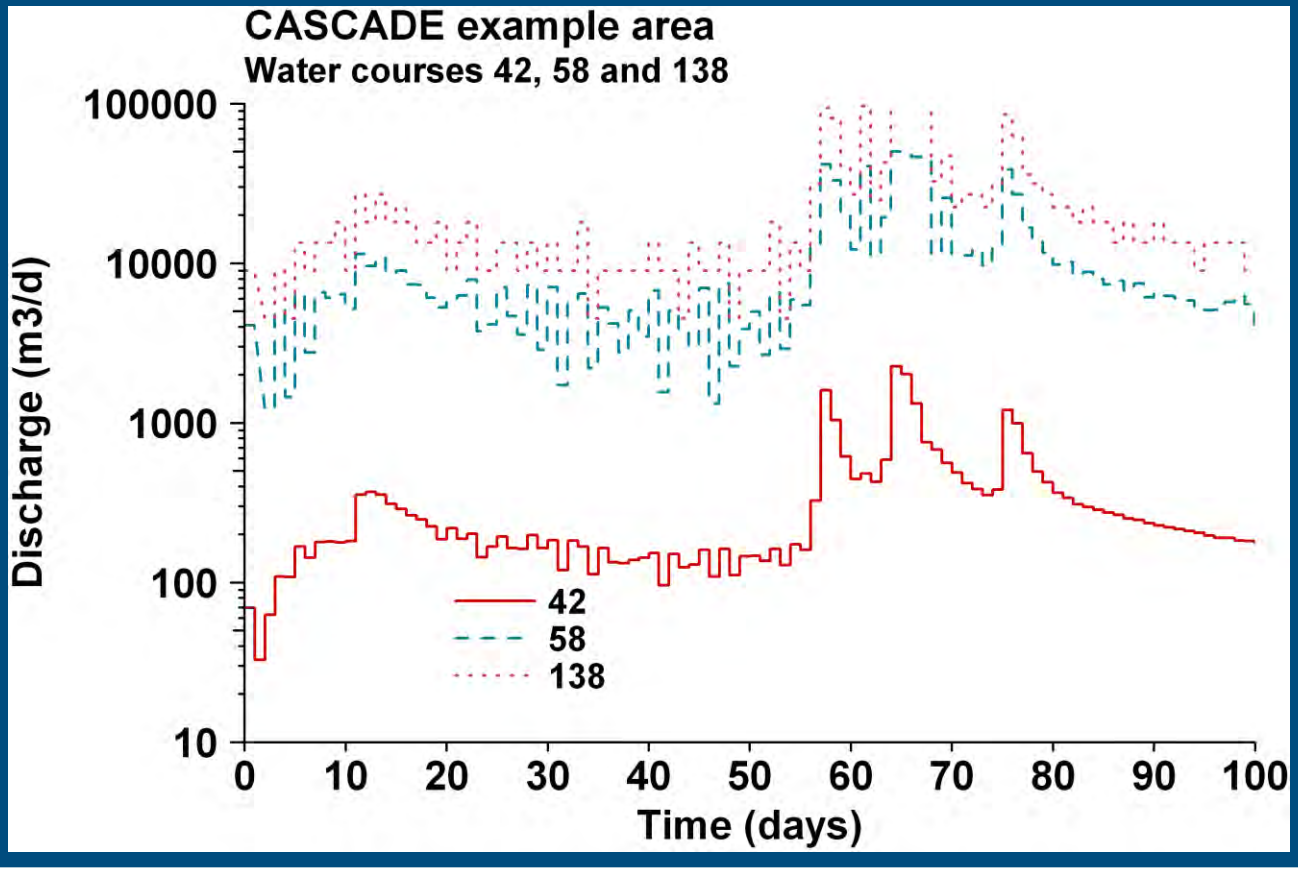
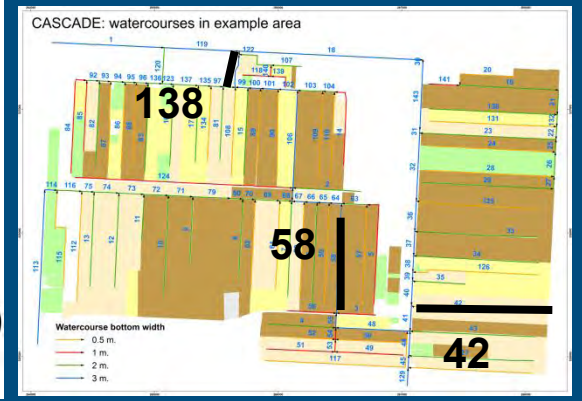


Run 1: Period with high discharge



From water course with loading to outlet discharge increase by a factor 50



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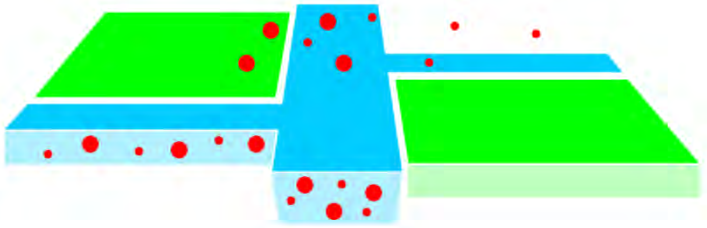
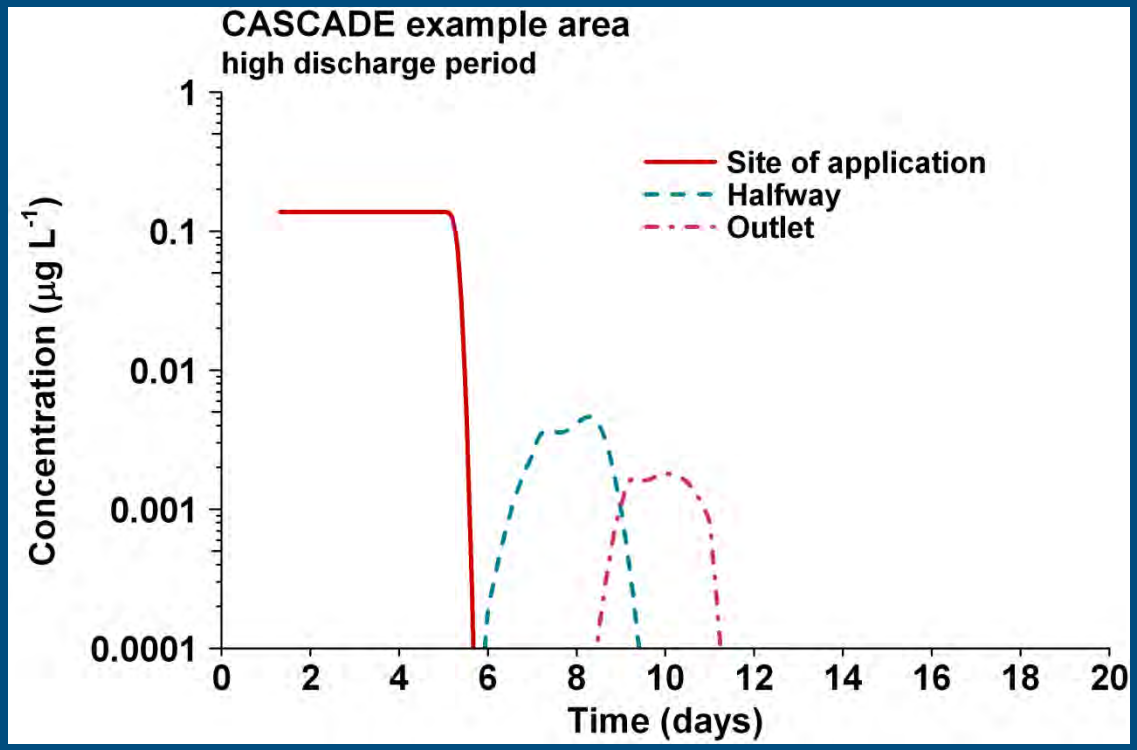
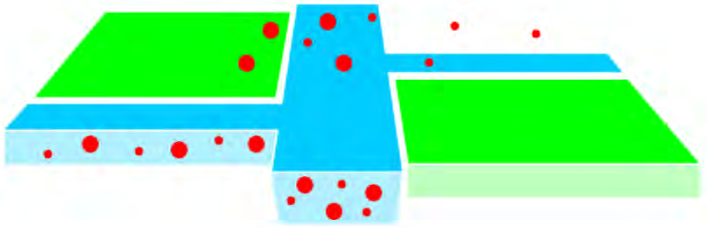


Run 1: Period with high discharge



Concentration a factor 70 lower by outlet (end watercourse 138).

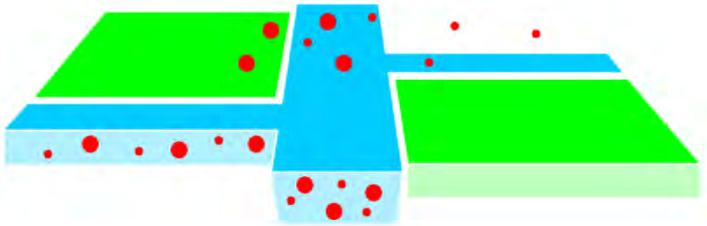
CASCADE – TOXSWA

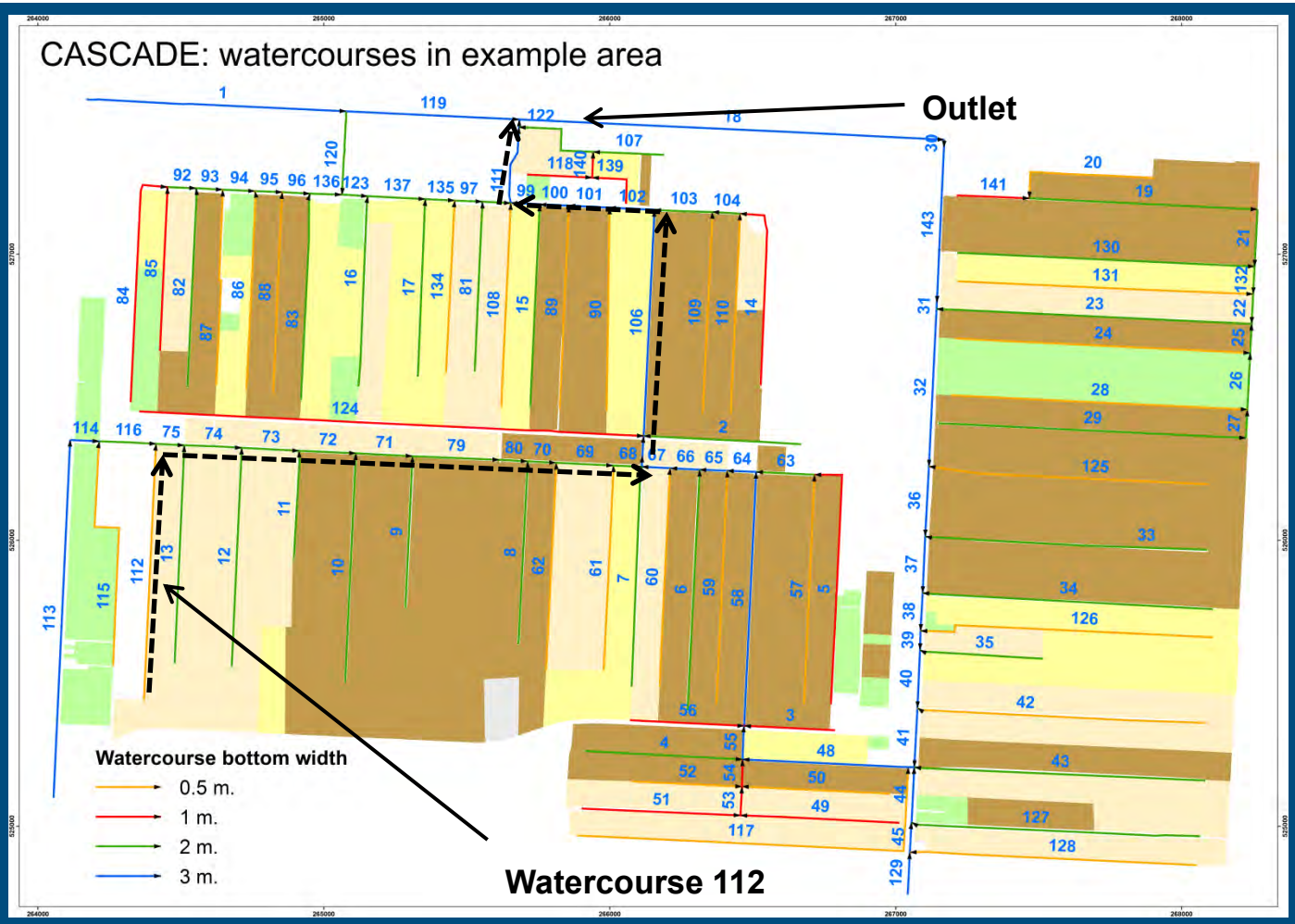


CASCADE run 2

- Period with low discharge rates (April - July 1993)
- Loading watercourse with tracer on 7 April 1993, length watercourse 900 m.
- Concentration patterns at three locations in the area (site of application, halfway to outlet and at outlet)

CASCADE – TOXSWA





Loading on 7 April in watercourse 112

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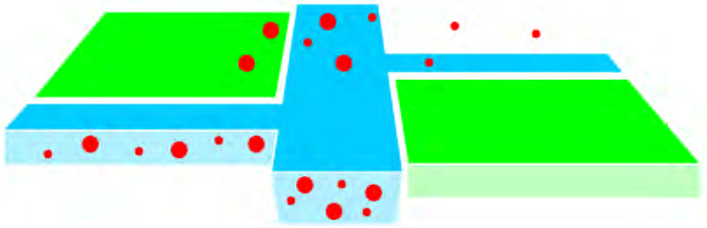
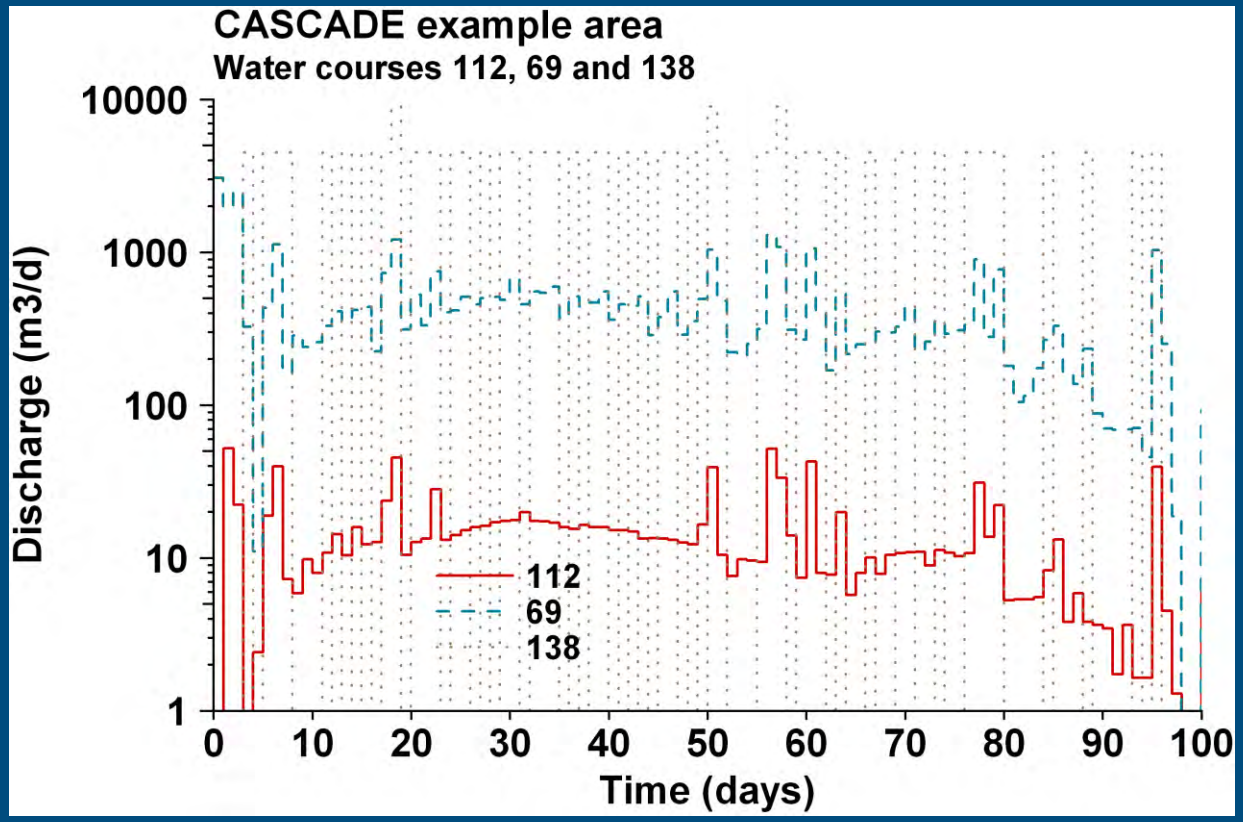
CASCADE – TOXSWA



Run 1: Period with low discharge



From watercourse with loading to outlet discharge increase by up to a factor 500

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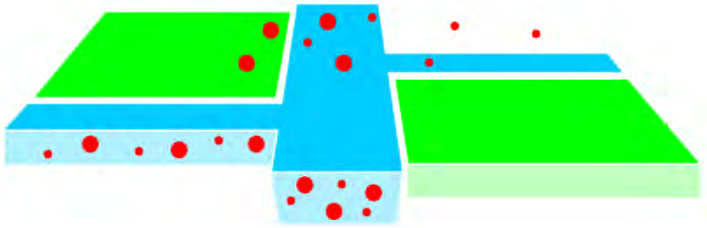
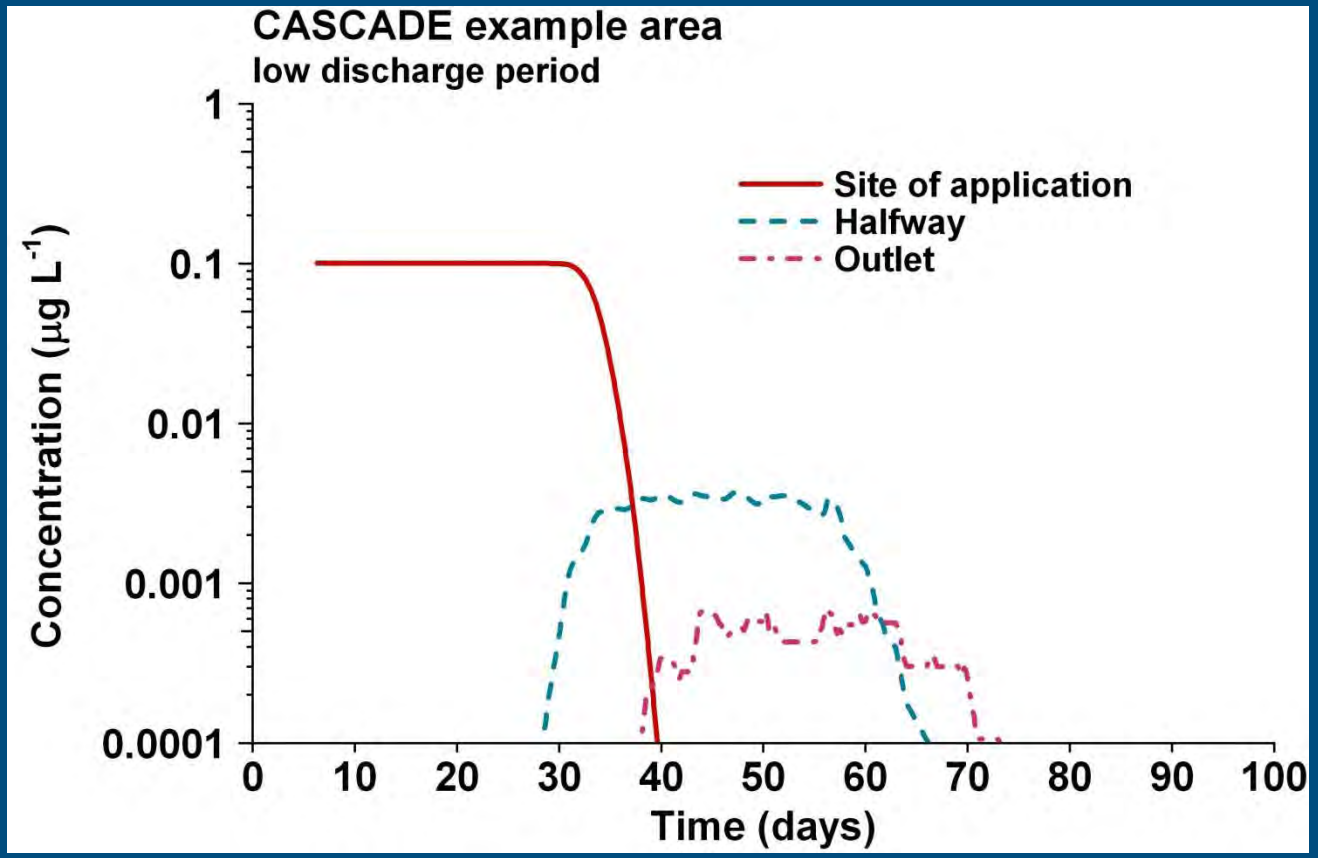
CASCADE – TOXSWA

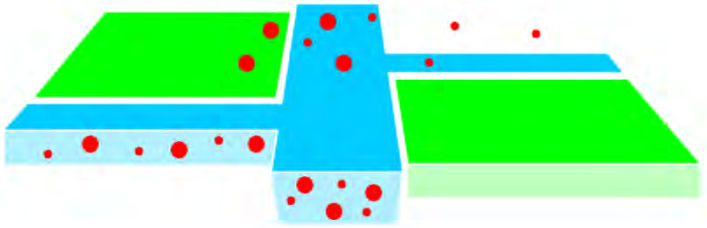


Run 2: Period with low discharge



Concentration a factor 100 lower by outlet (end water course 138).

CASCADE – TOXSWA



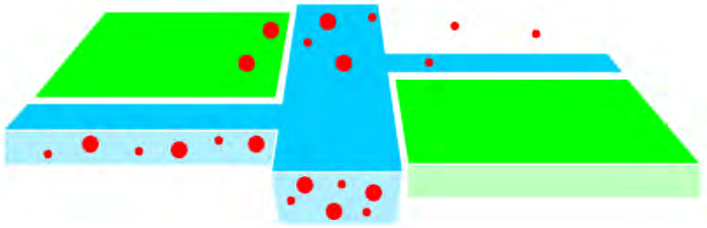
Summary CASCADE runs

• Period with high water discharge rates: bulk mass of tracer out of water course loaded after 4-5 days after application; about 10 days after application out of example area

• Period with low water discharge rates: bulk mass of tracer out of water course loaded after about 35 days; about 65 days after application out of example area

• Dilution factor from site of entry to outlet about is 70-100; this is the same order of magnitude as the quotient of the total length of watercourses and the length of the water course treated.

CASCADE – TOXSWA



CASCADE-TOXSWA: on-going development

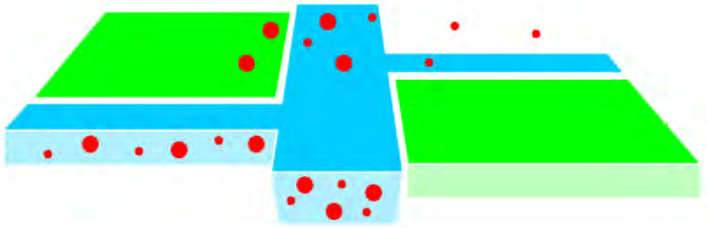
- Inclusion of sorption to suspended solids and macrophytes and transformation in water phase

- Addition of sediment compartiment and exchange between waterlayer and sediment

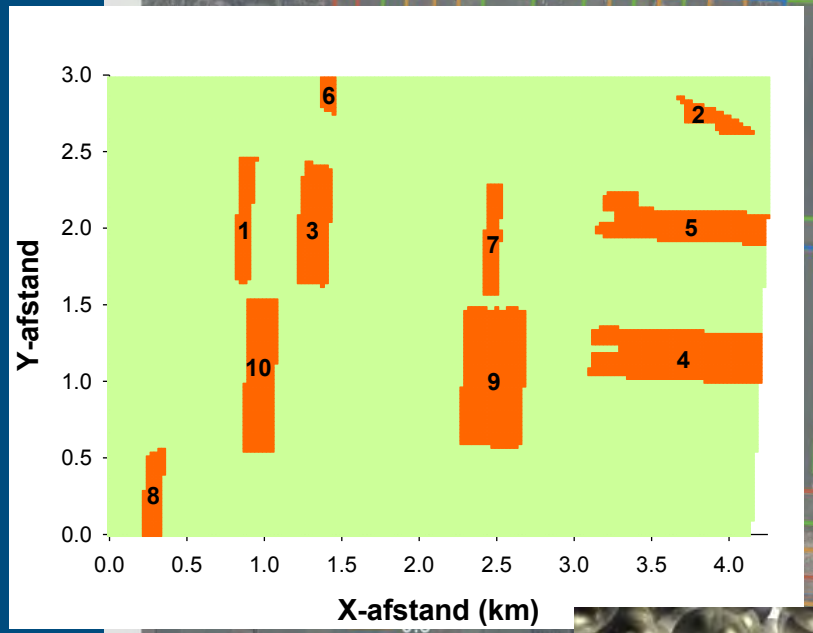
- Inclusion of other entry routes, e.g. atmospheric deposition, drainage

- Linking CASCADE-TOXSWA to effect models

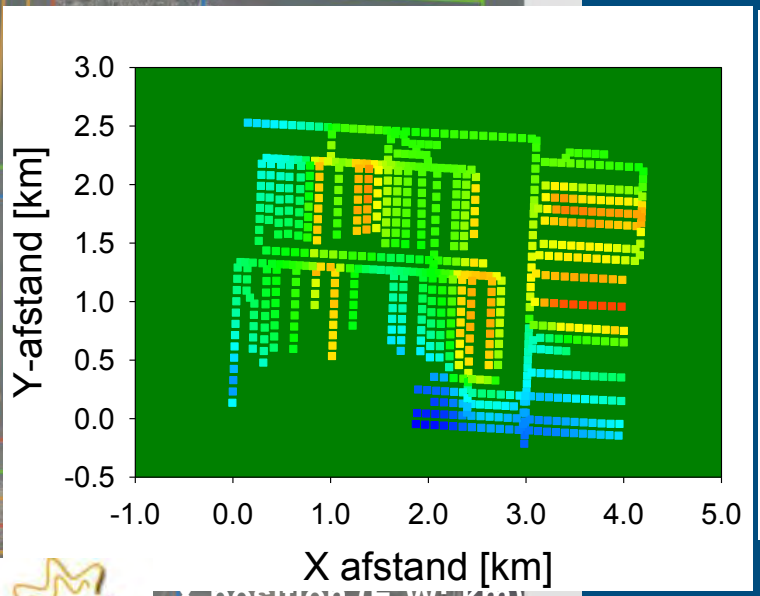
CASCADE – TOXSWA

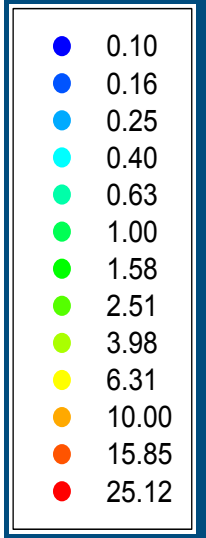


CASCADE-TOXSWA: on-going development - 2



Deposition (g/ha) on watercourses





X-position (E-W; km)

X-position (E-W; km)

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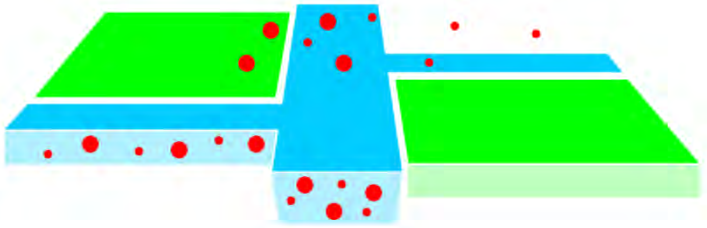

Thanks for your attention

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