Environmental Fate Modelling
February 22nd 2012

FOCUS sw — Part II
FOCUS STEP 3

Assumptions in Step 2:

- Entry routes: spray drift, runoff, drainage
- Application rate for multiple applications (g/ha)
- Specification of the season of application
- Substance properties: DT50 total system, solubility in water, KOC value, DT50 soil, DT50 water, DT50 sediment
- Use related assumptions: spray drift values for multiple applications, interception values
- Regional specification: Northern and Southern Europe

North

South
FOCUS STEP 3

Assumptions in Step 3:

• Entry routes: Spray drift, runoff, drainage
• Application rate for multiple applications (g/ha)
• Specification of the season of application and of the chemical application method
• Substance properties: DT50 total system, solubility in water, KOC value, DT50 soil, DT50 water, DT50 sediment and vapour pressure
• Use related assumptions: spray drift values for multiple applications, interception values, application window
• Regional specification of 10 scenarios across Europe

FOCUS sw scenarios
10 locations:
– 6 drainage scenarios
– 4 runoff scenarios
– Spray drift occurring at all locations

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FOCUS STEP 3

Step 3: representative field sites

- Climate
- Representative Field Site & Weather Station
- Soil
- Surface water bodies
- Landscape
- Crops

FOCUS Step 3 – scenario development
FOCUS STEP 3

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10 scenarios identified according to the worst-case nature of their inherent agro-environmental characteristics:
- Climate
- Slope
- Soil

Step 3 scenario development:
- European datasets

Climate
- average annual precipitation
- daily maximum spring rainfall
- average spring and autumn temperatures
- average annual recharge

Landscape characteristics
- slope
- soil texture, drainage status and parent material

Land cover and cropping
### Step 3 Scenario Development: Climate

#### Table 3.2-1 Climatic temperature classes for differentiating agricultural scenarios

<table>
<thead>
<tr>
<th>Average Autumn &amp; Spring Temperature</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range °C</td>
<td></td>
</tr>
<tr>
<td>&lt;6.6</td>
<td>Extreme worst-case</td>
</tr>
<tr>
<td>6.6 – 10</td>
<td>Worst case</td>
</tr>
<tr>
<td>10 – 12.5</td>
<td>Intermediate case</td>
</tr>
<tr>
<td>&gt;12.5</td>
<td>Best case</td>
</tr>
</tbody>
</table>

FOCUS, 2001

#### Table 3.2-2 Climatic classes for differentiating agricultural drainage and runoff scenarios

<table>
<thead>
<tr>
<th>Average Annual Recharge (drainage)</th>
<th>Average Annual Rainfall (Run-off)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range mm</td>
<td>Assessment</td>
</tr>
<tr>
<td>&gt;300</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>200 – 300</td>
<td>Worst case</td>
</tr>
<tr>
<td>100 – 200</td>
<td>Intermediate case</td>
</tr>
<tr>
<td>&lt;100</td>
<td>Best case</td>
</tr>
</tbody>
</table>

FOCUS, 2001
**Step 3 scenario development: Landscape**

<table>
<thead>
<tr>
<th>Range %</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>4 – 10</td>
<td>Worst case</td>
</tr>
<tr>
<td>2 – 4</td>
<td>Intermediate case</td>
</tr>
<tr>
<td>&lt;2</td>
<td>Best case</td>
</tr>
</tbody>
</table>

*Table 3.2-3* Slope classes for differentiating agricultural runoff scenarios

**Step 3 scenario development: Soil**

<table>
<thead>
<tr>
<th>Soil Characteristics</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarsely structured ‘cracking clay’ soils with extreme by-pass flow on impermeable substrates</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>Clays and heavy loams with by-pass flow over shallow groundwater</td>
<td>Worst case</td>
</tr>
<tr>
<td>Sands with small organic matter content over shallow groundwater</td>
<td>Worst case</td>
</tr>
<tr>
<td>Light loams with small organic matter content and some by-pass flow on slowly permeable substrates</td>
<td>Intermediate case</td>
</tr>
</tbody>
</table>

*Table 3.2-4* Relative worst-case soil characteristics for Drainage

FOCUS, 2001
FOCUS STEP 3

Step 3 scenario development: Soil

Table 3.2-5 Relative worst-case soil characteristics for Runoff

<table>
<thead>
<tr>
<th>Soil Characteristics</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil hydrologic group D(^1) (heavy clay soils)</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>Soil hydrologic group C(^1) (silty or medium loamy soils with low organic matter content)</td>
<td>Worst case</td>
</tr>
<tr>
<td>Soil hydrologic group B(^1) (light loamy soils with small clay and moderate organic matter content)</td>
<td>Intermediate case</td>
</tr>
</tbody>
</table>

\(^1\) Descriptions of hydrologic groups are according to the PRZM manual (Carsel et al., 1995)

FOCUS, 2001

10 representative field sites were identified

D1  Lanna (Sweden)  
D2  Brimstone (UK)  
D3  Vredepel (Belgium)  
D4  Skousbo (Denmark)  
D5  La Jaillere (France)  
D6  Thiva (Greece)  
R1  Weiherbach (Germany)  
R2  Porto (Portugal)  
R3  Bologna (Italy)  
R4  Ruanan (France)  

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### Step 3 scenarios:

**Table 3.2-8:** Relative inherent worst-case characteristics for non-irrigated run-off scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Temperature</th>
<th>Rainfall</th>
<th>Soil</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Worst case</td>
<td>Intermediate case</td>
<td>Worst case</td>
<td>Intermediate case</td>
</tr>
<tr>
<td>R2</td>
<td>Intermediate case</td>
<td>Extreme worst case</td>
<td>Intermediate case</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>R3</td>
<td>Intermediate case</td>
<td>Worst case</td>
<td>Worst case</td>
<td>Worst case</td>
</tr>
<tr>
<td>R4</td>
<td>Best case</td>
<td>Intermediate case</td>
<td>Worst case</td>
<td>Worst case</td>
</tr>
</tbody>
</table>

**Table 3.2-7:** Relative inherent worst-case characteristics for non-irrigated drainage scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Temperature</th>
<th>Recharge</th>
<th>Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Extreme worst case</td>
<td>Intermediate case</td>
<td>Worst case</td>
</tr>
<tr>
<td>D2</td>
<td>Worst case</td>
<td>Worst case</td>
<td>Extreme worst case</td>
</tr>
<tr>
<td>D3</td>
<td>Worst case</td>
<td>Worst case</td>
<td>Worst case</td>
</tr>
<tr>
<td>D4</td>
<td>Worst case</td>
<td>Intermediate case</td>
<td>Intermediate case</td>
</tr>
<tr>
<td>D5</td>
<td>Intermediate case</td>
<td>Intermediate case</td>
<td>Worst case</td>
</tr>
<tr>
<td>D6</td>
<td>Best case</td>
<td>Worst case</td>
<td>Worst case</td>
</tr>
</tbody>
</table>
## Step 3 scenarios:

<table>
<thead>
<tr>
<th>Name</th>
<th>Mean annual Temp. (°C)</th>
<th>Annual Rainfall (mm)</th>
<th>Topsoil</th>
<th>Organic matter (%)</th>
<th>Slope (%)</th>
<th>Water bodies</th>
<th>Weather station</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>6.1</td>
<td>556</td>
<td>Silty clay</td>
<td>2.0</td>
<td>0 - 0.5</td>
<td>Ditch, stream</td>
<td>Lanna</td>
</tr>
<tr>
<td>D2</td>
<td>9.7</td>
<td>642</td>
<td>Clay</td>
<td>3.3</td>
<td>0.5 - 2</td>
<td>Ditch</td>
<td>Brimstone</td>
</tr>
<tr>
<td>D3</td>
<td>9.9</td>
<td>747</td>
<td>Sand</td>
<td>2.2</td>
<td>0 - 0.5</td>
<td>Ditch</td>
<td>Vredepeel</td>
</tr>
<tr>
<td>D4</td>
<td>8.2</td>
<td>659</td>
<td>Loam</td>
<td>1.2</td>
<td>0.5 - 2</td>
<td>Pond, stream</td>
<td>Skousbo</td>
</tr>
<tr>
<td>D5</td>
<td>11.8</td>
<td>651</td>
<td>Loam</td>
<td>1.3</td>
<td>2 - 4</td>
<td>Pond, stream</td>
<td>La Jailliere</td>
</tr>
<tr>
<td>D6</td>
<td>16.7</td>
<td>683</td>
<td>Sand</td>
<td>1.2</td>
<td>0 - 0.5</td>
<td>Ditch</td>
<td>Thiva</td>
</tr>
<tr>
<td>R1</td>
<td>10.0</td>
<td>744</td>
<td>Silt loam</td>
<td>2.2</td>
<td>0.5 - 2</td>
<td>Pond</td>
<td>Weiherbach</td>
</tr>
<tr>
<td>R2</td>
<td>14.8</td>
<td>1402</td>
<td>Sandy loam</td>
<td>4</td>
<td>20*</td>
<td>Stream</td>
<td>Porto</td>
</tr>
<tr>
<td>R3</td>
<td>13.6</td>
<td>682</td>
<td>Clay loam</td>
<td>1</td>
<td>10*</td>
<td>Stream</td>
<td>Bologna</td>
</tr>
<tr>
<td>R4</td>
<td>14.0</td>
<td>709</td>
<td>Sandy clay loam</td>
<td>0.6</td>
<td>5</td>
<td>Stream</td>
<td>Roujan</td>
</tr>
</tbody>
</table>

* = terraced to 5%

D2: represents a 99.3 percentile worst case for all drained agricultural land
R2: represents a 98 percentile worst case for all agricultural runoff land
FOCUS STEP 3

Crop and management parameters

<table>
<thead>
<tr>
<th>Scenario</th>
<th>2a</th>
<th>2b</th>
<th>2c</th>
<th>2d</th>
<th>2e</th>
<th>2f</th>
<th>2g</th>
<th>2h</th>
<th>2i</th>
<th>2j</th>
<th>2k</th>
<th>2l</th>
<th>2m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carrot</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cabbage</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Onion</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Peas</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Apple</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

70th percentile wettest weather data used

Irrigation used

FOCUS Step 3 – water bodies
FOCUS STEP 3

**water bodies**

- edge of field” surface water bodies were identified for each of the selected 10 scenarios
- absence of data bases mapping the characteristics of surface water bodies over Europe
  
  - expert judgement was used to identify three categories of “edge of field” surface water body that are common in Europe
    - **Pond**: static or slow moving
    - **Ditch**: relatively slow moving
    - **First order stream**: fast moving

### Table 4.4.1-1  Water bodies associated with scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Inputs</th>
<th>Slope (%)</th>
<th>Soil type</th>
<th>Water body type(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Drainage and drift</td>
<td>0 - 2</td>
<td>Clay</td>
<td>Ditch, stream</td>
</tr>
<tr>
<td>D2</td>
<td>Drainage and drift</td>
<td>0 - 2</td>
<td>Clay</td>
<td>Ditch, stream</td>
</tr>
<tr>
<td>D3</td>
<td>Drainage and drift</td>
<td>0</td>
<td>Sand</td>
<td>Ditch</td>
</tr>
<tr>
<td>D4</td>
<td>Drainage and drift</td>
<td>0 - 2</td>
<td>Light loam</td>
<td>Pond, stream</td>
</tr>
<tr>
<td>D5</td>
<td>Drainage and drift</td>
<td>0 - 4</td>
<td>Heavy loam</td>
<td>Ditch</td>
</tr>
<tr>
<td>R1</td>
<td>Runoff and drift</td>
<td>2 - 4</td>
<td>Light silt</td>
<td>Pond, stream</td>
</tr>
<tr>
<td>R2</td>
<td>Runoff and drift</td>
<td>10 - 30</td>
<td>Light loam</td>
<td>Stream</td>
</tr>
<tr>
<td>R3</td>
<td>Runoff and drift</td>
<td>0 - 100</td>
<td>Heavy loam</td>
<td>Stream</td>
</tr>
<tr>
<td>R4</td>
<td>Runoff and drift</td>
<td>2 - 10</td>
<td>Medium loam</td>
<td>Stream</td>
</tr>
</tbody>
</table>

Presence or absence of these categories of water body at each site was assessed from local knowledge and validated by examining detailed field-scale maps of the relevant areas.
FOCUS STEP 3

Characteristics of the water bodies

• In order to parameterise each water body as a set of characteristics relating to the dimensions, sediment, and organic components and hydrology are required.

• Of these characteristics, the water body dimensions and sediment and organic components were fixed for each water body type irrespective of the scenario.

**Dimensions**

<table>
<thead>
<tr>
<th>Type of water body</th>
<th>Width (m)</th>
<th>Total length (m)</th>
<th>Distance from top of bank to water (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditch</td>
<td>100</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Pond</td>
<td>30</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Stream</td>
<td>100</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

Sediment and Organic components

• Identical to Steps 1 & 2.

• The sediment layer represents a relatively vulnerable sediment layer in agricultural areas and its properties are based on experimental data.

• No macrophytes (the calculated exposure concentrations are tend to be conservative; macrophytes tend to adsorb pesticides)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration of sediment in water column (mg L⁻¹)</td>
<td>15</td>
</tr>
<tr>
<td>Sediment just above water</td>
<td>5</td>
</tr>
<tr>
<td>Organic carbon content (%)</td>
<td>5 (approx. 9% organic matter)</td>
</tr>
<tr>
<td>Dry bulk density (kg m⁻³)</td>
<td>800</td>
</tr>
<tr>
<td>Porosity (%)</td>
<td>60</td>
</tr>
</tbody>
</table>
Characteristics of the water bodies

Hydrology

<table>
<thead>
<tr>
<th>Surface water body</th>
<th>Average water depth (m)</th>
<th>Average hydraulic residence time (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond</td>
<td>1.0</td>
<td>60</td>
</tr>
<tr>
<td>Ditch</td>
<td>0.3</td>
<td>1</td>
</tr>
<tr>
<td>Stream</td>
<td>0.3 to 0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

flows within any water body are dynamic, reflecting the various base flow, runoff and drainage responses to rainfall events in the water body’s catchments. To characterise such flow dynamics, the concept of ‘Hydraulic residence time’ was used with the following definition:

\[
\tau = \frac{V}{Q}
\]

\(\tau\) = hydraulic residence time (d)
\(V\) = volume of water body considered (m³)
\(Q\) = discharge flowing out of water body (m³/d)
• Standard buffers between crop and surface water body are used in Step 1, 2 and 3 (defined by the "FOCUS surface water workgroup")

• Spray drift values used in each STEP are determined by:

<table>
<thead>
<tr>
<th></th>
<th>Crop</th>
<th>Number of applications</th>
<th>Type of water body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
**FOCUS STEP 3**

**Water body Step 1 & 2**

- Water depth (cm): 30
- Sediment OC (%): 5
- Sed. bulk density (g/ml): 0.8
- Ratio of field:water body: 10

**Effective sediment depth = 1cm**

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**FOCUS STEP 3**

**water body at Step 3**

- Distance from crop to far edge of water
- Distance from crop to near edge of water
- Distance from crop to top of bank of water
- Distance from top of bank to water
- Width of water body

- Water bodies: 0.5 m (ditch) / 1 m (stream) / 3 m (pond)

Crop specific: from 0.5m to 5m

Integrated width of the water body
FOCUS STEP 3

water body at Step 3

- For each class a default distance from edge of the treated field to the top bank of the water body was defined.
- Distance range from 0.5 m to 3 m for ground applications and 5 m for aerial applications.
- The horizontal distance from the top of the bank to the water body is specific to each type and was defined as 0.5 m for ditches, 1.0 m for streams and 3.0 m for ponds.

Application methods:
- ground spray
- air blast
- soil incorporated
- granular
- aerial application
FOCUS STEP 3

Application methods:
- ground spray (spray drift)
- air blast (spray drift)
- soil incorporated (no drift)
- granular (no drift)
- aerial application (spray drift)
Chemical application method (CAM):

- determines how the substance is distributed in the soil
- CAM1: application to soil, linear decline in soil
- CAM2: application to plant, linear decline in soil
- ...
- CAM8: application at a user specified depth

Description of the CAM types:

1. Application to soil with linear decline to user-specified depth
2. Application to foliage with interception based on crop canopy and linear decline in soil to user-specified depth
3. Not used in FOCUS Step 3
4. Incorporation in soil with uniform profile and user-specified depth
5. Incorporation in soil with profile linearly increasing to user-specified depth
6. Incorporation in soil with profile linearly decreasing to user-specified depth
7. Not used in FOCUS Step 3
8. Incorporation in soil with total application located at user-specified depth
FOCUS Step 3 – Tools

2. FOCUS Spray Drift Calculator

3. FOCUS SWASH

4. FOCUS PRZM

5. FOCUS TOXSWA

6. Output file

DRAINAGE SCENARIOS

RUNOFF SCENARIOS

ALL SCENARIOS

SWASH
Surface Water Scenarios Help

EN-Health and Consumer Protection
FOCUS version 1.0

Input to MACRO, PRZM and TOXSWA
To calculate transport concentrations in water bodies
FOCUS STEP 3 - TOOLS

General procedure:
- All scenario, use and substance definitions are made by the user in the SWASH shell
- SWASH generates specific input files for each of the models (MACRO, PRZM, TOXSWA)
- MACRO and PRZM are started by the user and run independently from each other
- TOXSWA combines the output from either MACRO + Drift calculator (drainage) or PRZM + Drift calculator (runoff) and
- generates output files for each of the surface water scenarios

Runoff model: PRZM
- Leaching model, used to simulate runoff and erosion
- Pathway simulation with 2 metabolites possible

Drainage model: MACRO
- Leaching model, used to simulate drainflow, includes preferential flow
- Pathway simulation with 1 single metabolite possible
FOCUS STEP 3 - TOOLS

Drift rates in FOCUS Step 3

Example: areic mean drift rates for a single application

<table>
<thead>
<tr>
<th></th>
<th>Cereals</th>
<th>Rome fruit (early)</th>
<th>Vines (late)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond</td>
<td>0.22 %</td>
<td>4.73 %</td>
<td>0.61 %</td>
</tr>
<tr>
<td>Ditch</td>
<td>1.98 %</td>
<td>23.6 %</td>
<td>5.17 %</td>
</tr>
<tr>
<td>Stream</td>
<td>1.43 %</td>
<td>21.6 %</td>
<td>4.29 %</td>
</tr>
</tbody>
</table>
FOCUS STEP 3 - TOOLS

Application Timing
→ Application timing has an influence on Predicted environmental concentrations
→ Pesticide losses via runoff or drainage are ‘event driven’ → strongly depend on climate conditions following the application

→ PAT (Pesticide Application Tool)

PAT – Pesticide Application Tool

• The PAT calculator eliminates a significant number of potential application dates due to the requirement that at least 10 mm of precipitation be received within ten days following application. This criteria in the PAT calculator results in selection of application dates.
• PAT minimises the user influence on the application date and on the results of the Step 3 calculations
FOCUS STEP 3 - TOOLS

PAT – Pesticide Application Tool

User input:
• Number of applications
• Minimum application interval
• First possible date of application
• Days in the application window

The minimum application window is defined as:

\[
\text{Application window} = 30 + (\text{Number of applications}-1) \times \text{Interval}
\]

FOCUS STEP 3 - TOOLS

PAT – Pesticide Application Tool

• Criteria for the selection of a specific application date:
• At least 10 mm of precipitation (cumulative) should occur within 10 days of an application
• No more than 2 mm/day of precipitation should occur on any day within a 5-day period starting two days before application
• If no dates are found in the meteorological files that meet these criteria, the precipitation targets and timing in the two rules are progressively relaxed until acceptable application dates are found
• fate modelling in the surface water body
• Integrates inputs from MACRO (drainage) or PRZM (runoff) and the spray drift deposition calculated by the spray drift calculator
• Does not simulate formation of metabolites
FOCUS STEP 3 - TOOLS

- Total simulation period:
  - MACRO: 6 years
  - PRZM: 20 years
  - TOXSWA: 12 months (R-scenarios)
  - 16 months (D-scenarios)
- Total run time:
  - ca. 30 minutes per individual run
  - e.g. winter cereals (14 individual runs): ca. 7 hours
Swash shell

**FOCUS STEP 3 - TOOLS**

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![SWASH: Surface Water Scenarios Help](image)

**22 February 2012 FOCUSsw - Part I 58**

![Create, View and Edit Substances](image)
Default values for plant uptake and wash-off

Degradation parameter
Create a new project:

- **FOCUS Wizard**: Generate project with all possible turns for selected substance and crop location.
- **User Defined Wizard**: Generate project with all possible turns for selected substance, crop, waterbody type and crop combination.
- **View Projects and Define Applications**: View projects, define applications and property packs for MACRO, PREM and T0XSWA.
- **Write Substance Data**: Update substance database MACRO and substance list T0XSWA. Substance data are automatically present.

**Update SWASH database**.
FOCUS STEP 3 - TOOLS

Create:
- Project name
- Description

Choose:
- Substance data
- Crop

FOCUS STEP 3 - TOOLS

Define applications:

- Update SWASH database
- Generate project with all possible runs for selected substance and crop location
- Generate project with all possible runs for selected substance, crop, waterbody type and climatic combinations
- View projects, define applications and property output for MACRO, PREM and TOXSWA
- Update substance database MACRO and substance lists from PREM and TOXSWA, substance data are automatically present
- Update substance database MACRO and substance lists from PREM and TOXSWA
FOCUS STEP 3 - TOOLS

D-Scenario

Use pattern:
- Application method
- Number of applications
- First possible application date
- Number of days for the application window
- Application interval
- Application rate
R-Scenario

Chemical Application Model (CAM):
- Soil linear (on the soil)
- Foliar linear (on the plant)

Create input data:

Export FOCUS input to MACRO, PRZM and TOXSWA
FOCUS STEP 3 - TOOLS

The PRZM Shell:

- Create, View and Edit Substances
  - FOCUS Wizard
  - User-defined Wizard
- View Projects and Define Applications
- Write Substance Data
- Exit

**Update SWASH database.**
Generate project with all possible runs for selected substance and crop location.
Generate project with all possible runs for selected substance, crop, wetland type and scenario combination.
View projects, define applications and input to MACRO, PRZM and TOXSWA.
Update substance database MACRO and substance file PRZM, TOSWAA, substance data are automatically present.
Update substance database MACRO and substance file PRZM and TOSWAA.

---

**FOCUS STEP 3 - TOOLS**

**FOCUS**

**PRZM SW 1.5.6, 19 April 2003**

Select/Change Project Directory
- Input SWASH Project File
- Input PRZM Project File

Current Project Directory: Default

**PRZM in FOCUS**
FOCUS STEP 3 - TOOLS

The results are automatically transferred to TOXSWA.
FOCUS STEP 3 - TOOLS

The MACRO Shell:

- **Create, View and Edit Substances**
  - Update SMAIL database.
  - Generate project with all possible runs for selected substance and crop location.

- **User-defined Wizard**
  - Generate project with all possible runs for selected substance, crop, edaphology type and emission combination.

- **View Projects and Define Applications**
  - View projects, define applications and prepare input to MACRO, PRZM and TOXSWA.

- **Write Substances Data**
  - Update substance database MACRO and substance list PRZM, TOXSWA; substance data are automatically present.

- **Exit**
  - Update substance database MACRO and substance list PRZM and exit SWARM.
FOCUS STEP 3 - TOOLS

Choose of crop and scenario (Drainage).

Choose of the substance.
Choose of the application scheme of the project

- Defining applications (surface water scenarios)
- Application method:
  - Dust
  - Air blast
  - Granule
  - Incorporated
  - Local

Note: The dose given here is the actual applied amount. Consumption is calculated immediately in @HACH@ for surface water scenarios.
FOCUS STEP 3 - TOOLS

1. Choose crop
2. Choose RUNID
3. Transfer of results to TOXSWA

The TOXSWA Shell:

- **FOCUS Wizard**: Generate project with all possible runs for selected substance and crop location.
- **User-defined Wizard**: Generate project with all possible runs for selected substance, crop, waterbody type and scenario combination.
- View Projects and Define Applications
- Write Substance Data
- Exit
FOCUS STEP 3 - TOOLS

Choose for graphical output
**FOCUS STEP 3 - TOOLS**

**TOXSWA output:**
Hourly concentrations within the total simulation period.

**TOXSWA evaluation:**

- **Global maximum concentration**
  Maximum of all peaks within the total simulation period

- **Actual concentrations**
  Actual concentrations after the global maximum

- **Time-weighted average concentrations**
  Maximum of average concentrations over a certain time period (e.g., 7 days) after the global maximum

---

### Hourly concentrations within the total simulation period

<table>
<thead>
<tr>
<th>Time</th>
<th>Maximum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 May 1992</td>
<td>1.647 pg/L</td>
</tr>
<tr>
<td>30 May 1992</td>
<td>1.104 pg/L</td>
</tr>
<tr>
<td>31 May 1992</td>
<td>0.0019 pg/L</td>
</tr>
<tr>
<td>1 June 1992</td>
<td>0.00044 pg/L</td>
</tr>
<tr>
<td>2 June 1992</td>
<td>0.00031 pg/L</td>
</tr>
<tr>
<td>3 June 1992</td>
<td>0.000137 pg/L</td>
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<tr>
<td>1-3 June 1992</td>
<td>0.00074 pg/L</td>
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<tr>
<td>2-3 June 1992</td>
<td>0.000477 pg/L</td>
</tr>
<tr>
<td>4-6 June 1992</td>
<td>0.000303 pg/L</td>
</tr>
<tr>
<td>7-10 June 1992</td>
<td>0.000011 pg/L</td>
</tr>
<tr>
<td>11-14 June 1992</td>
<td>0.000009 pg/L</td>
</tr>
</tbody>
</table>

---

**Report-File**
FOCUS STEP 3 - TOOLS

### Tools

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<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Type</th>
<th>Grundeinschlag</th>
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<tr>
<td>FOCUS_FOCUS</td>
<td>948</td>
<td>EXE</td>
<td>09/2012/13/14</td>
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<tr>
<td>FOCUS_Focus</td>
<td>214</td>
<td>EXE</td>
<td>09/2012/13/14</td>
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<td>09/2012/13/14</td>
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<td>FOCUS_Focus</td>
<td>548</td>
<td>EXE</td>
<td>09/2012/13/13</td>
</tr>
</tbody>
</table>

Got to „Run-ID_pa.sum“

---

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Additional information

Date of application | Rate of application | Spray drift rate

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Date of max. PECsw

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Identification of the main entry route in Step 3:

- **Day of application = Day of max. concentration**
  - Main entry route: spray drift

- **Day of application ≠ Day of max. concentration**
  - Main entry route: drainage (D-scenarios)
  - Main entry route: runoff (R-scenarios)
FOCUS STEP 3 - TOOLS

SWASH Exercise - Teil 1:

- **GAP:**
  - 3 applications with 0.75 kg/ha in pome and stone fruits
  - application interval: 7 days
  - BBCH 15-45 (Start application window: 1. April (Day 91))

- **E-Fate Parameter:**
  - Molar Mass: 300 g/mol
  - Vapour pressure: 9.9E-9 Pa
  - Water solubility: 2.00 mg/L
  - K_{FOC}-Wert: 1000 L/kg
  - Freundlich Exponent: 0.9
  - DT_{50} soil: 1.5 days
  - DT_{50} water: 0.50 days
  - DT_{50} sediment: 8.00 days

⇒ Create substance
⇒ create use pattern
⇒ Run PRZM, Run TOXSWA (R-Scenarios)
⇒ Ergebnisse: PECsw (act, twa), PECsed (act, twa), Main entry pathway

---

Results:

<table>
<thead>
<tr>
<th></th>
<th>PECsw (µg/L)</th>
<th>PECsed (µg/kg)</th>
<th>Main entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1s</td>
<td>37.619</td>
<td>4.800</td>
<td>Spray</td>
</tr>
<tr>
<td>R1p</td>
<td>2.894</td>
<td>2.565</td>
<td>Spray</td>
</tr>
<tr>
<td>R2s</td>
<td>50.710</td>
<td>4.491</td>
<td>Spray</td>
</tr>
<tr>
<td>R3s</td>
<td>53.231</td>
<td>13.091</td>
<td>Spray</td>
</tr>
<tr>
<td>R4s</td>
<td>37.841</td>
<td>6.019</td>
<td>Spray</td>
</tr>
</tbody>
</table>

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