

# Application of the SWAT model to the Hunnselva and Lena catchments, Norway

## **Example from the STRIVER project**

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Kilde: vassdragsforbundet

- Hunnselva and Lena are sub-basins in the Glomma river, Norway.
- Hunnselva is a 'EC WFD phase 1 basin'
- Hunnselva, area: 367 km<sup>2</sup>
- Lena, area: 295 km<sup>2</sup>

## Land use:

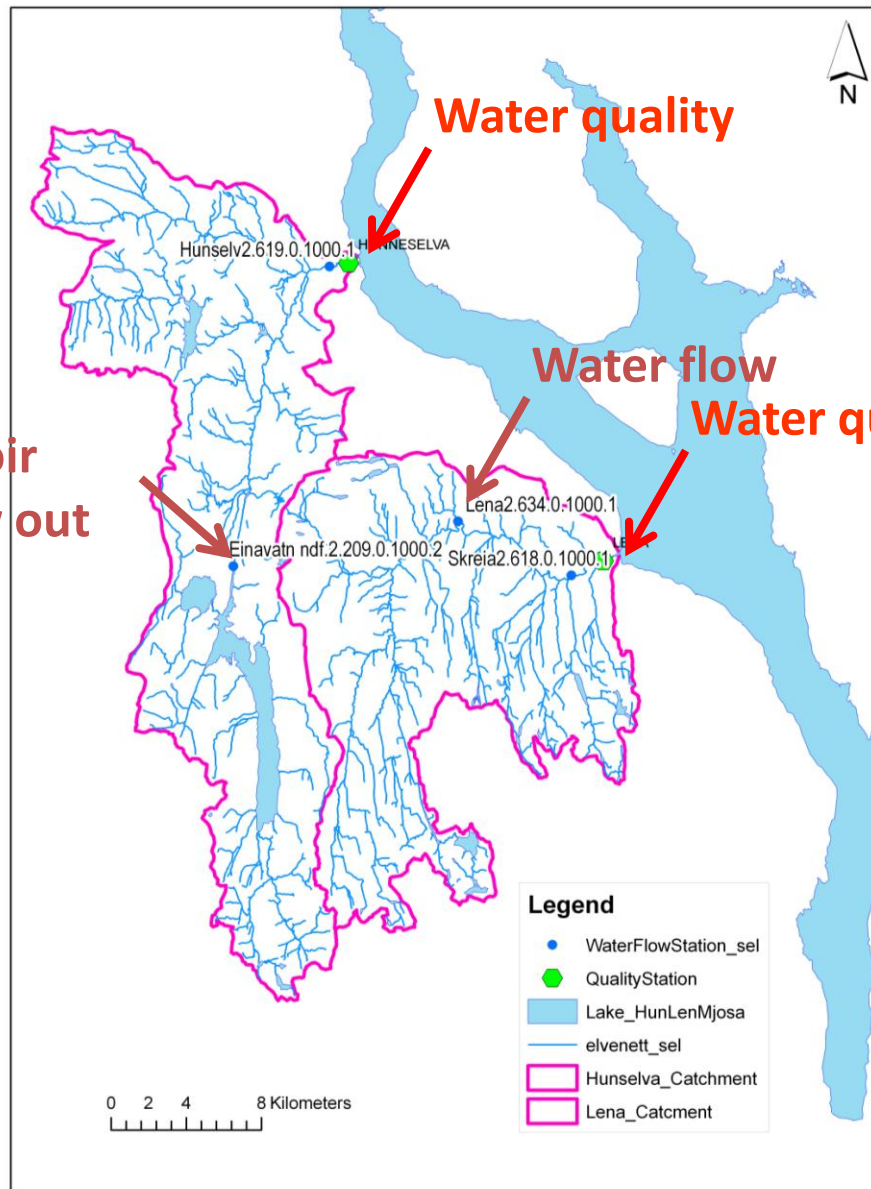
|                  | Forrest | Mountain | Lake   | Agriculture | Other  |
|------------------|---------|----------|--------|-------------|--------|
| <b>Hunnselva</b> | 66.49 % | 10.38 %  | 5.31 % | 15.23 %     | 1.30 % |
| <b>Lena</b>      | 52.55 % | 8.23 %   | 1.29 % | 36.60 %     | 1.25 % |

# Agricultural practice

Table 3. Distribution of agricultural crops and livestock numbers in Hunnselva and Lena catchment (1999 – 2007, source: Norwegian national Statistics/SSB)

|                   | Agricultural crops,<br>distribution |      | Livestock |           |        |
|-------------------|-------------------------------------|------|-----------|-----------|--------|
|                   | Hunnselva                           | Lena |           | Hunnselva | Lena   |
| Grain/oilseeds    | 63                                  | 71   | Cattle    | 7262      | 12261  |
| Grass/fodder      | 32                                  | 17   | Pigs      | 6095      | 15898  |
| Vegetables/potato | 0                                   | 7    | Chicken   | 24084     | 298938 |
| Strawberry, other | 0                                   | 1    | Sheep     | 7288      | 20113  |
| Other             | 4                                   | 4    |           |           |        |

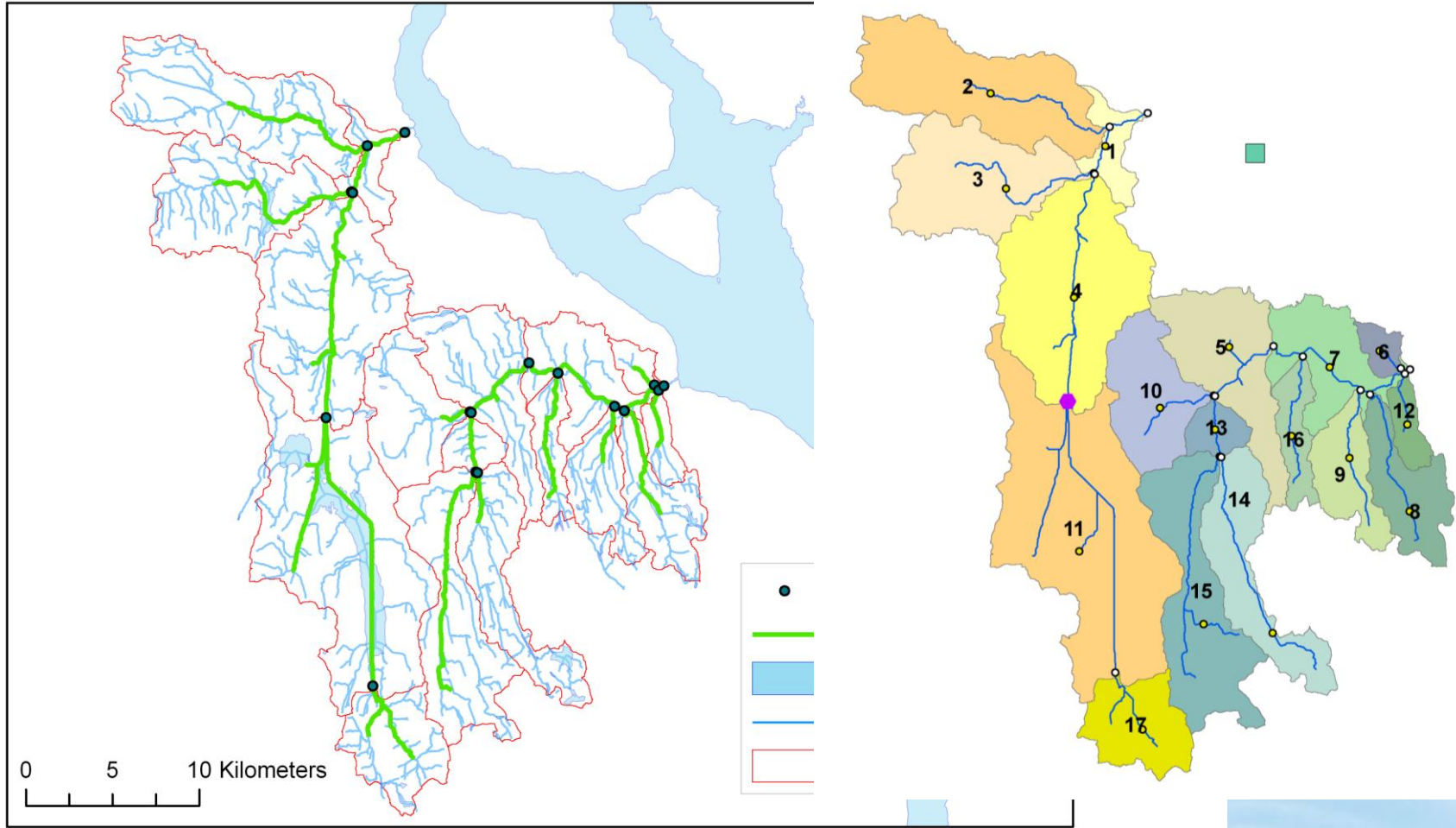
# SWAT model set-up



Main limitations:

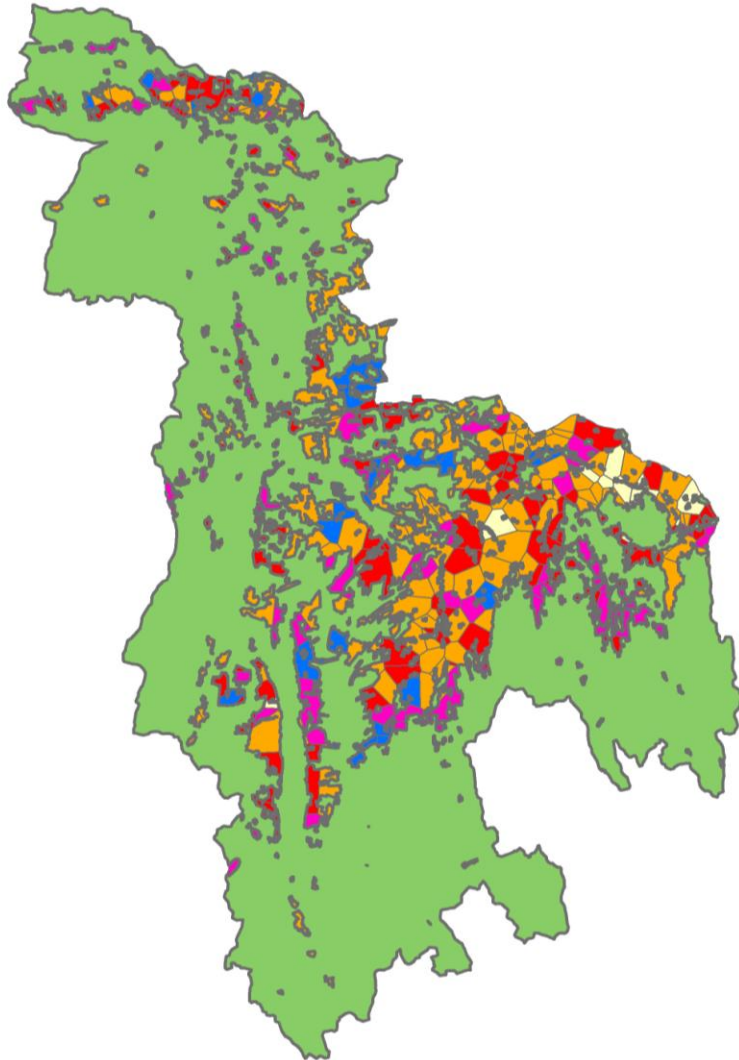
- Water flow not available at the outlets
- Water flow and quality not available for the same location
- Sediment measures not available

# SWAT model set-up




# Data construction


## Soil map



Soil\_NAME\_polygon\_Nclass\_Mer

 <all other values>

**SOILGROUP**

 2 - Organic soil

 3 - Clay

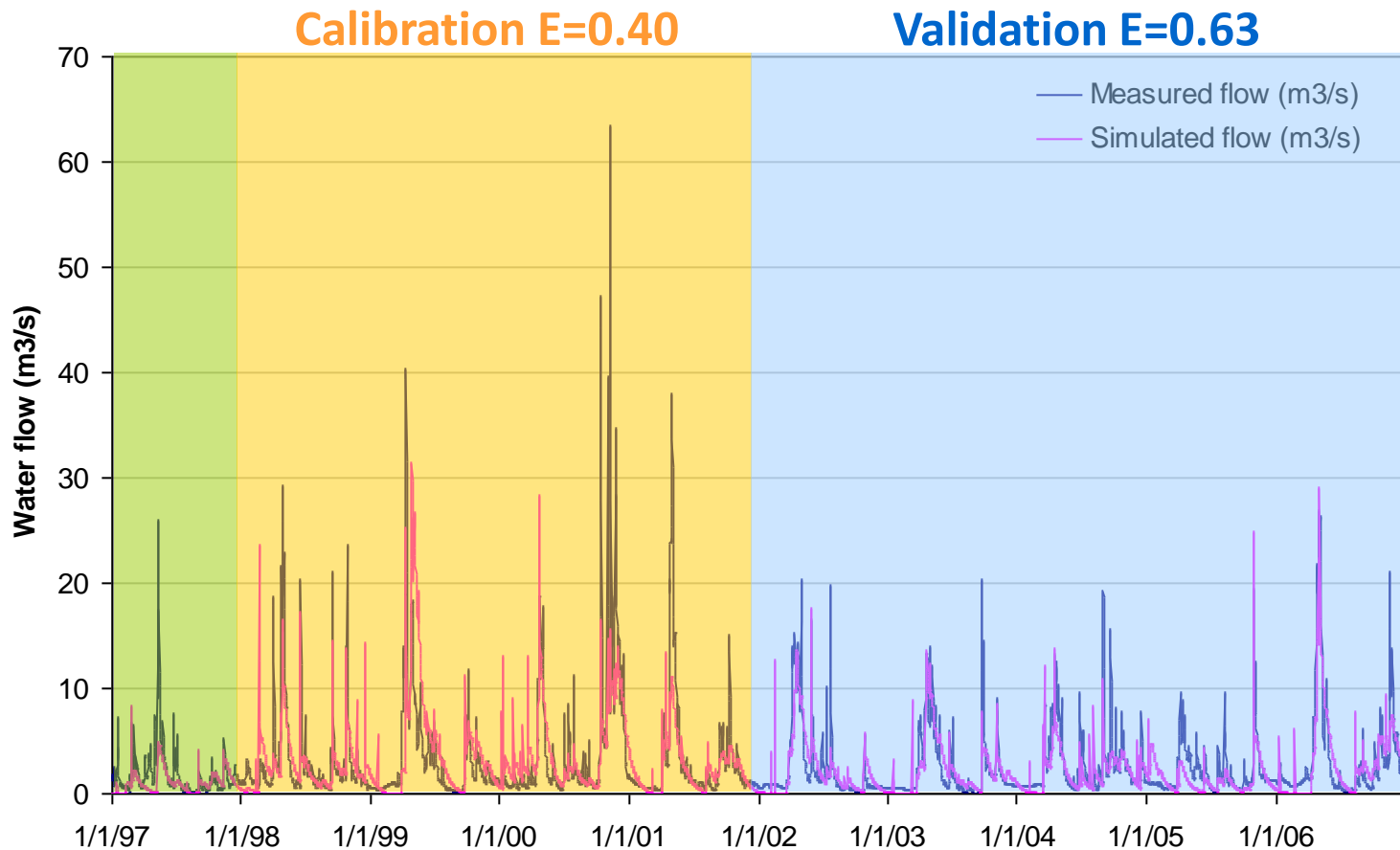
 4 - Loam

 5 - Silt

 6 - Sand

# SWAT model results for baseline

## Water flow: daily values



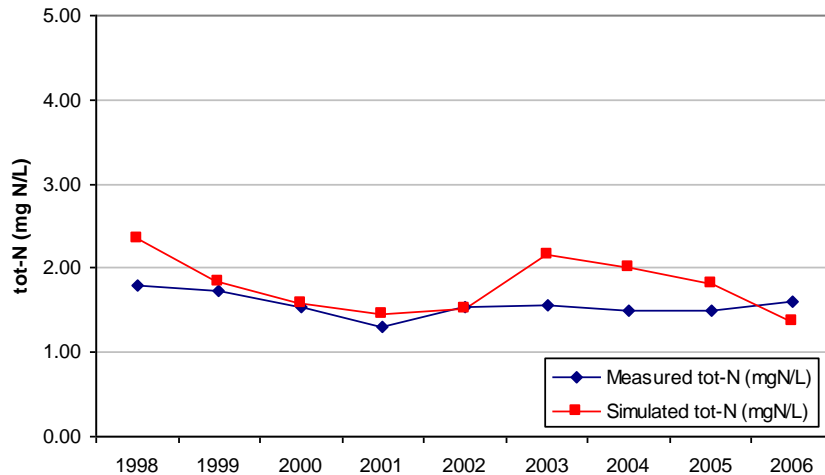
Station Lena 2.634.1000.1

22.05.2009

# SWAT model results for baseline

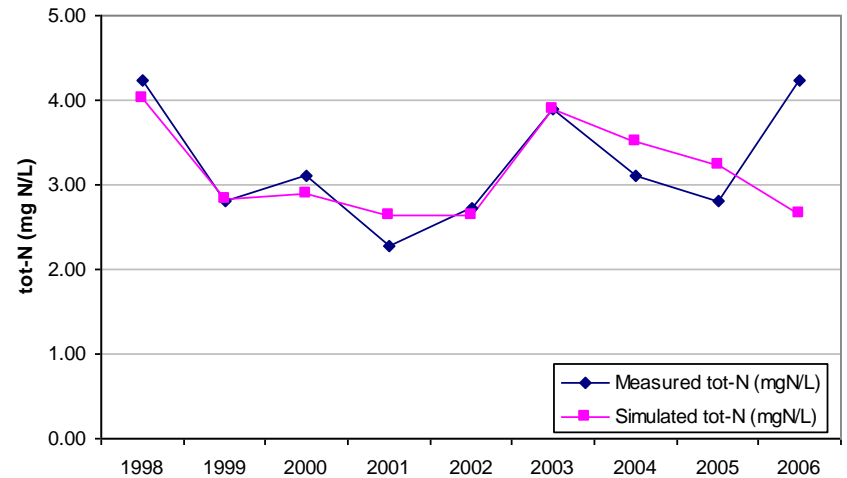
## Nitrogen: annual values

Annual N concentration Hunneselva



Station Hunneselva outlet

Annual N concentration Lena



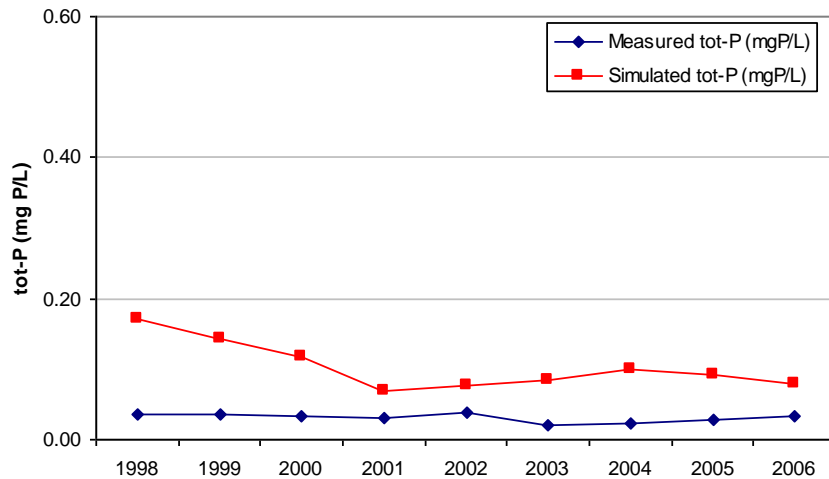
Station Lena outlet



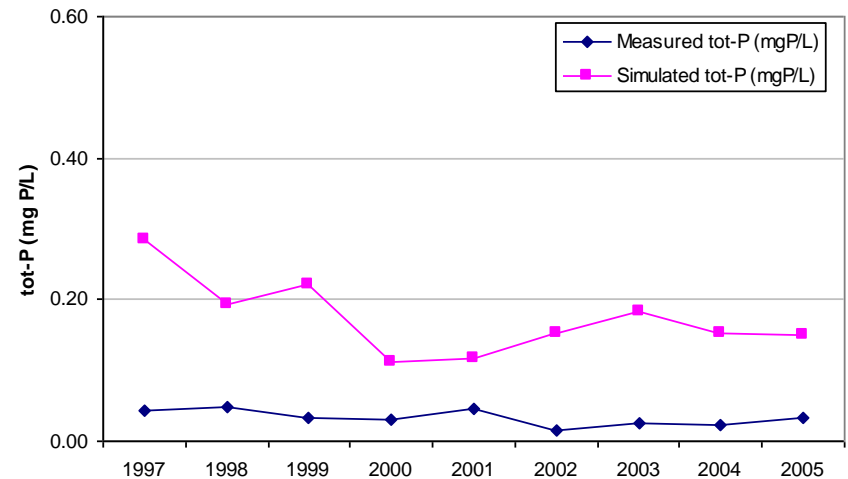
# SWAT model results for baseline

## Phosphorus: annual values

Annual P concentration Hunneselva



Annual P concentration Lena



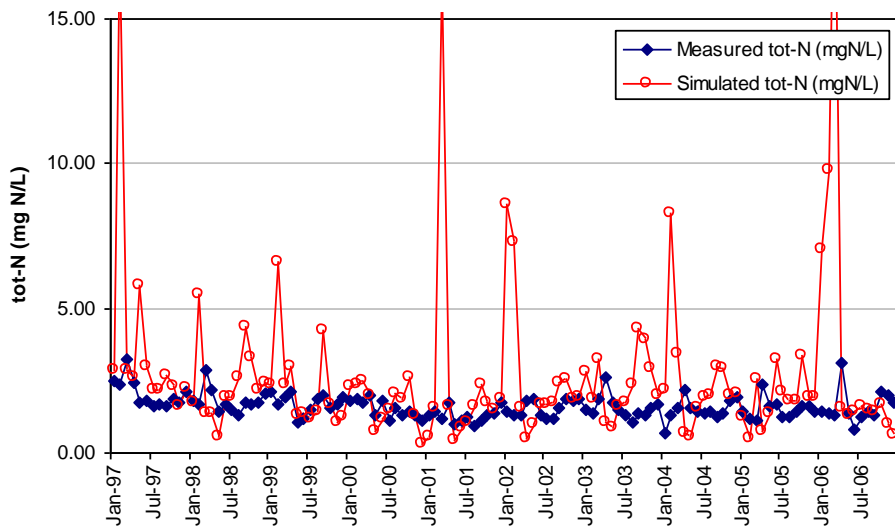
Station Hunneselva outlet

Station Lena outlet

# SWAT model results for baseline

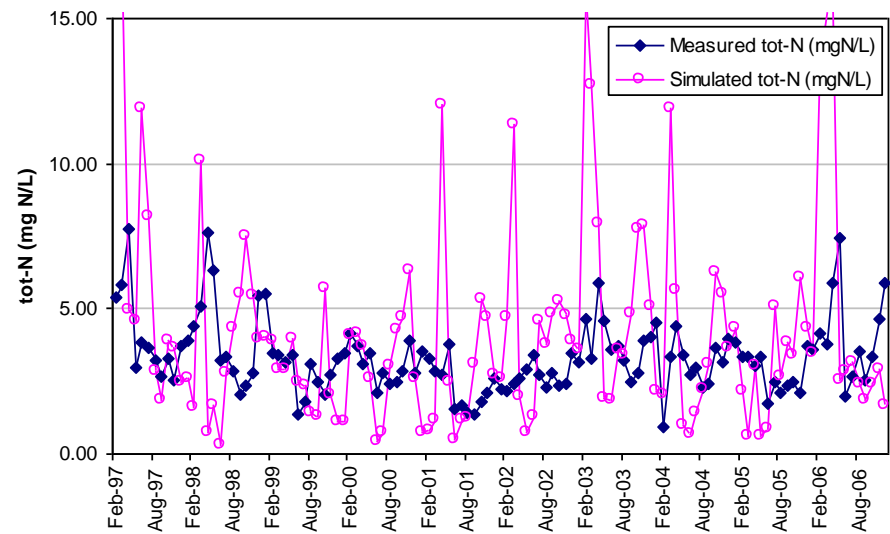
## Nitrogen: monthly values

N concentration Hunneselva



Station Hunneselva outlet

N concentration Lena

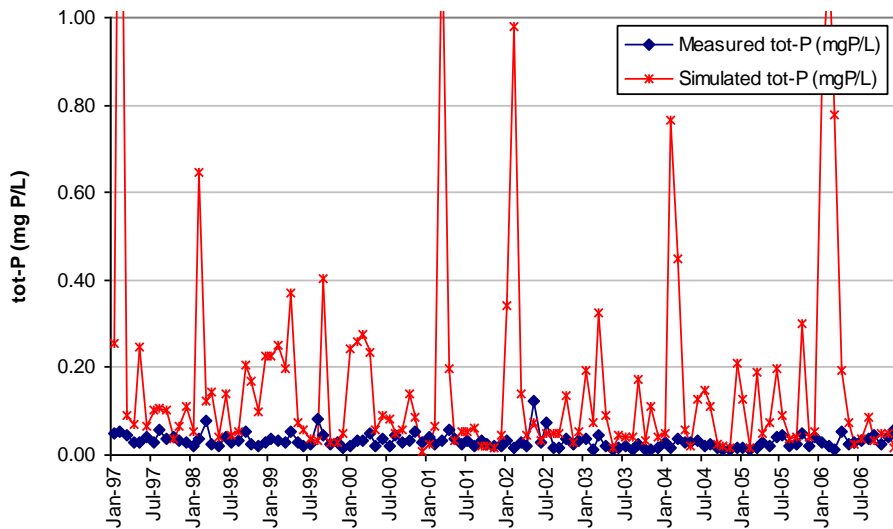


Station Lena outlet

# SWAT model results for baseline

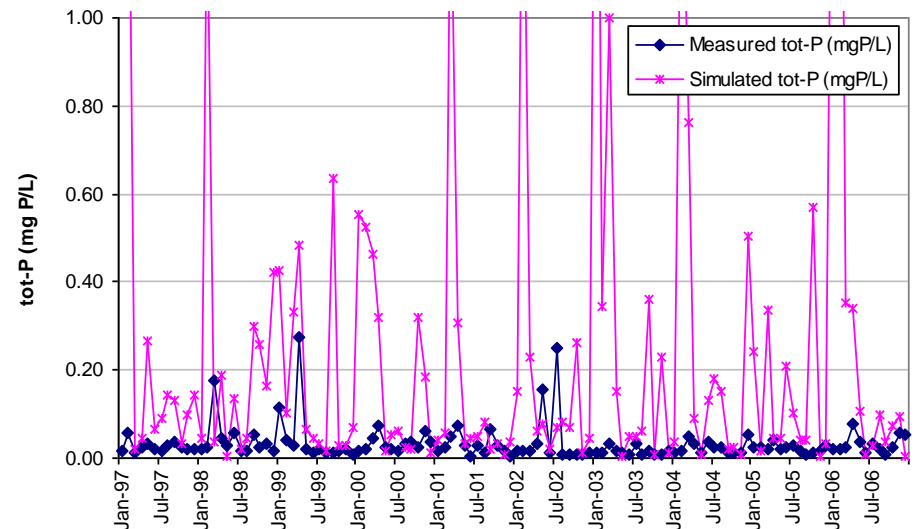
## Phosphorus: monthly values

P concentration Hunneselva



Station Hunneselva outlet

P concentration Lena



Station Lena outlet

## Scenario 1 – Reduced ploughing

For grain crops, notably barley, rapeseed and fodder in the modeling, the autumn ploughing is substituted by a light harrowing.

## Scenario 2 – Optimal fertilisation

The crop fertilizer applications are substituted by optimal fertilizer application estimated by the model, according to the actual crop needs.

## Scenario 3 – Increase in vegetables/berry production

The growing of more lucrative crops is extended. Barley is reduced from 15% (baseline) to 10% of the catchment area, while vegetables and strawberry are extended from 3% (baseline) to 8%.

# Scenarios results: absolute values

| Average 1998-2006                                | Concentration tot-N (mgN/L) | Concentration tot-P (mgP/L) | Sediment production (ton/ha) |
|--|-----------------------------|-----------------------------|------------------------------|
| Baseline   | 1.79                        | 0.10                        | 0.15                         |
| <b>Scenario 1</b><br>Reduced ploughing           | 1.61 ↓                      | 0.08 ↓                      | 0.12 ↓                       |
| <b>Scenario 2</b><br>Optimal fertilisation       | 1.20 ↓                      | 0.10                        | 0.15                         |
| <b>Scenario 3</b><br>Increase in vegetables/berr | 2.00 ↑                      | 0.10                        | 0.15                         |

Thank you for your attention!