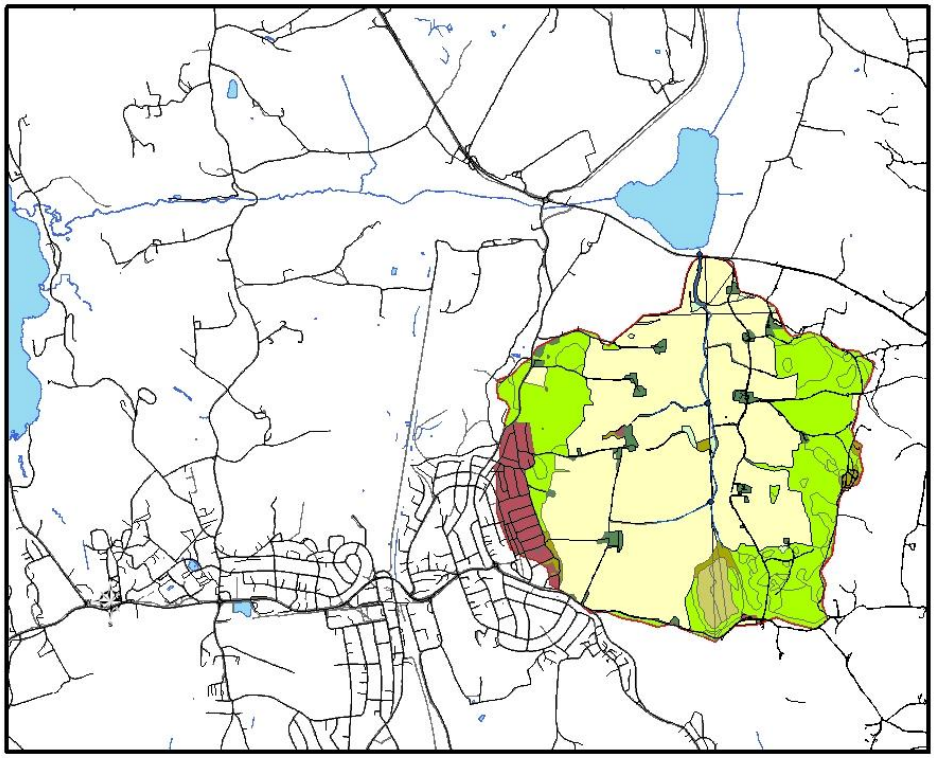
Running the Soil and Water Assessment Tool (SWAT) on the Skuterud Catchment



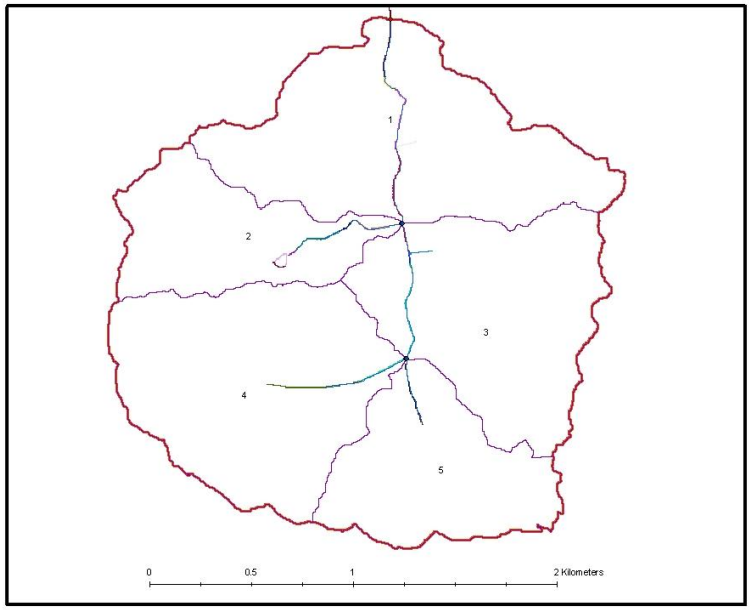
Input data: spatial data

- The spatial datasets include: Digital elevation model (DEM), soil map and land use map.
- The resolution of the DEM is 5 x 5 m.
- Since the soil map did not cover the whole area (area with forest not mapped) it was modified to fit the boundaries of the catchment. The soils where aggregated into three soil types. The physical parameters of the soil layers where read into the model.
- The land use map consisted of urban, agricultural, forested (deciduous, evergreen, mixed and wetland forested), water and range-brush areas.

Input data: weather datasets

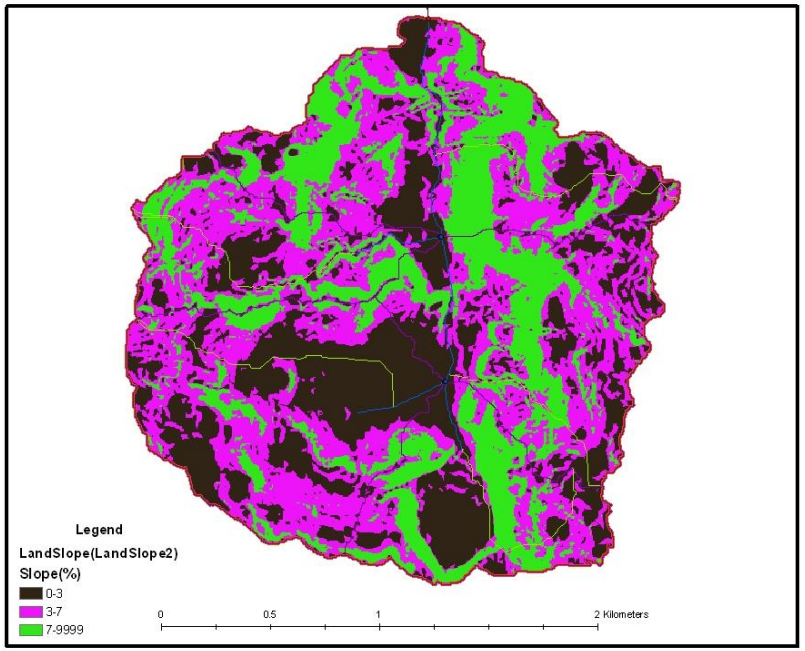
- Weather datasets include:
- Temperature (daily minimum and maximum temperature)
- Daily precipitation (mm)
- Average daily relative humidity
- Daily average solar radiation
- Daily average wind speed
- A dataset of 19 years was used to generate a user weather generator.
- In the modeling, observed data was used for the years 1994-1999.

Delineation of the Skuterud catchment



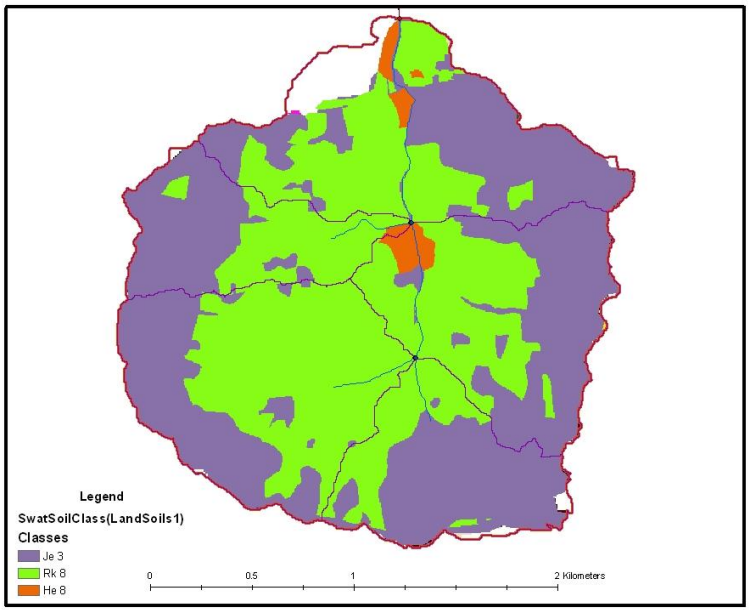
- A stream network was loaded into the model for a burn in, which means that the stream is superimposed on to the map for better accuracy.
- In the stream definition function the threshold based method was used. The threshold of 50 ha was chosen. This controls the areas of the subbasins.
- The delineation of the Skuterud basin produced five subbasins.
- An outlet point was added manually to the watershed.

Land use/slope/soils definition: slope of the Skuterud catchment



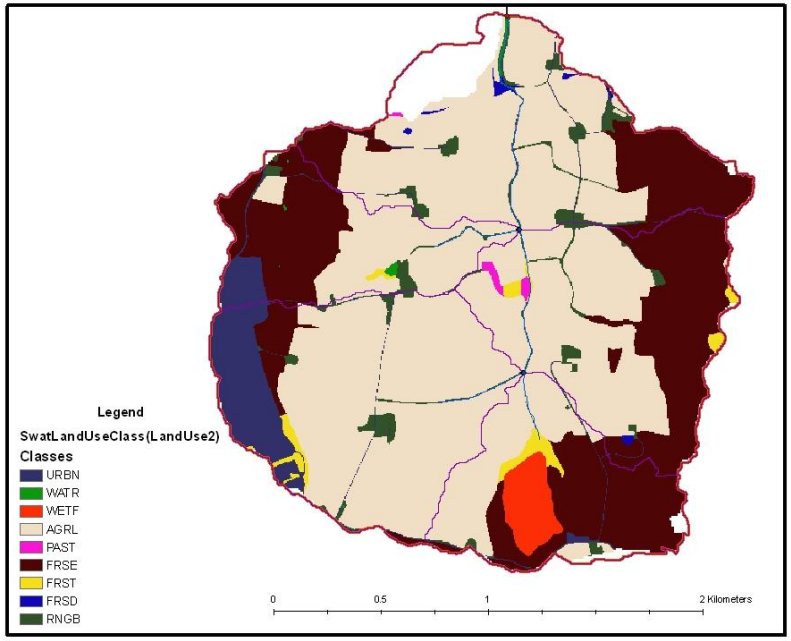
- Slope in %
- 0-3 31 % of the basin
- 3-7 42 % of the basin
- > 7 27 % of the basin

Land use/slope/soils definition: Soil map of the Skuterud catchment



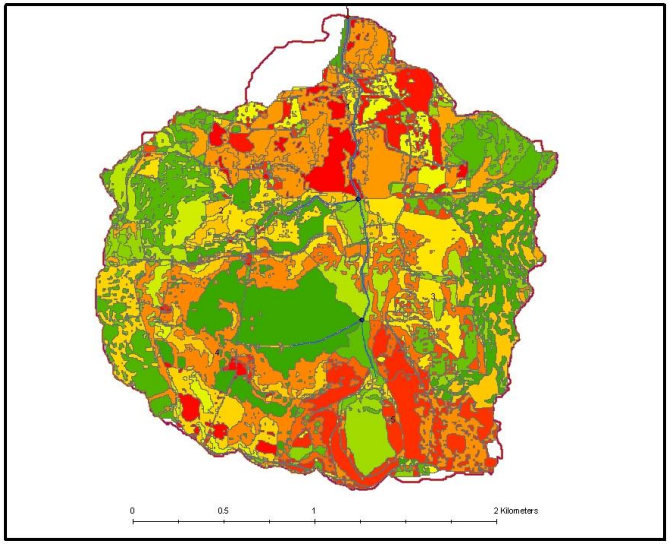
- Soils
- Je 3 49 % of the catchment
- Rk 8 46 % of the catchment
- He 8 1.5 % of the catchment

Land use/slope/soils definition: Land use map of the Skuterud catchment



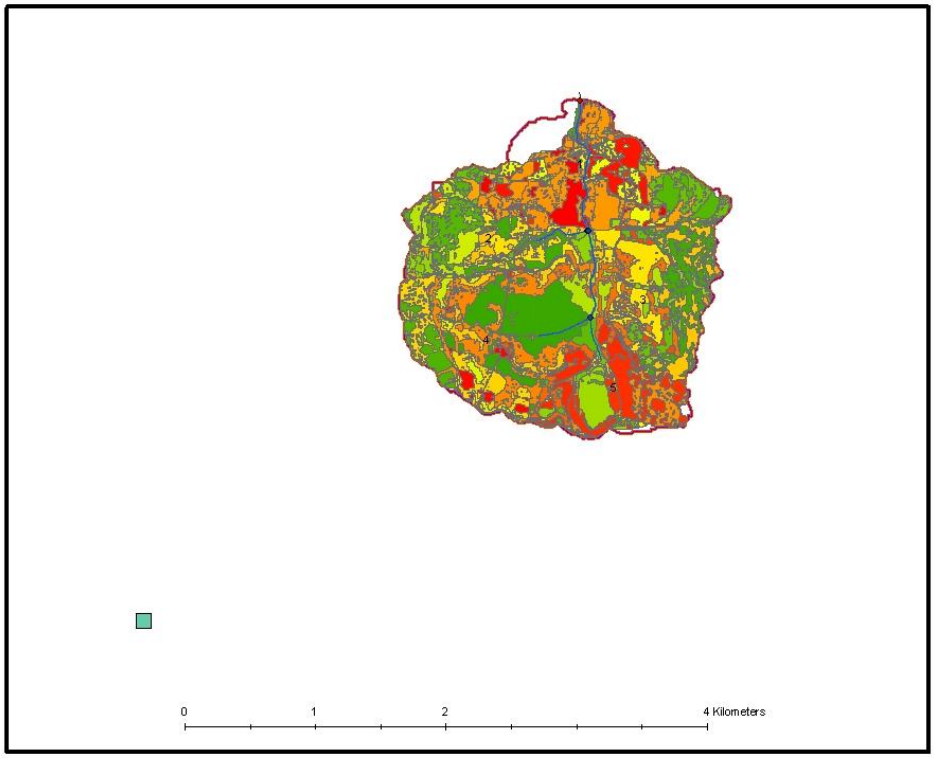
- Residential 5.54%
- Water 0.14%
- Wetlands-Forested 1.85%
- Agricultural Land-Generic 57.25%
- Pasture 0.21%
- Forest-Evergreen 26.68%
- Forest-Mixed 1.24%
- Forest-Deciduous 0.25%
- Range-Brush 3.14%

Hydrologic response unit



- The multiple HRUs option was chosen in the HRU definition tool. A threshold of 10 % was set to exclude minor land uses, soil types and slopes in each subbasin.
- The land use type *Agricultural Land-Generic* was split into four different land uses so that the area with agriculture where represented in a more realistic way. These where winter wheat (30 %), spring wheat (5 %), oat (22 %) and barley (9 %).
- A total of 115 HRUs where produced.

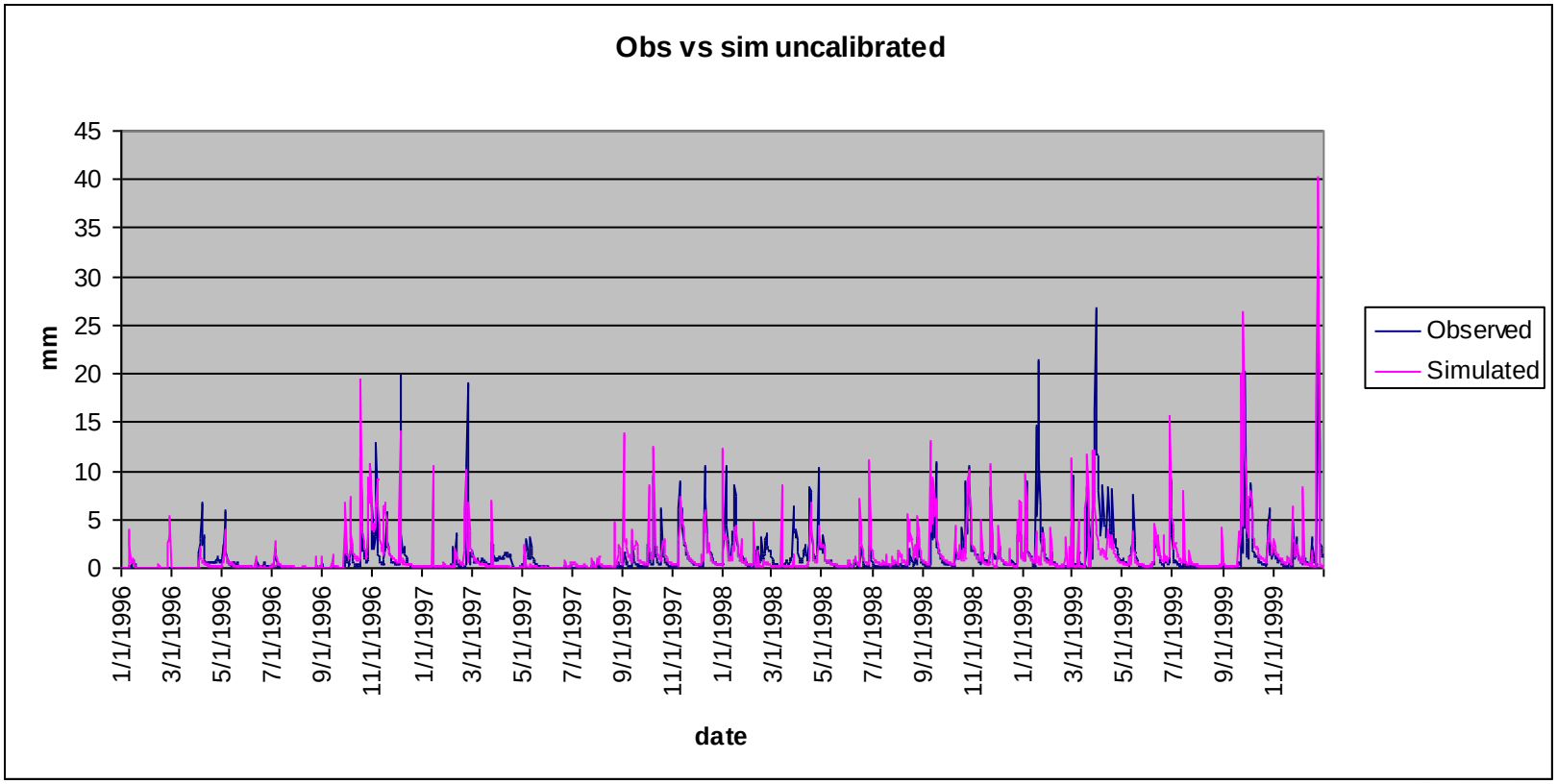
Weather station



Parameterization of the model

- Before running the model, some parameters had to be changed. Among others, a management operation file (plant/beginning growing season parameters, fertilizer application, tillage operation, harvest and kill operation, etc) where loaded into the model for each crop.
- Tile drainage parameters had to be set. These are depth to subsurface drain (1000 mm), time to drain soil to field capacity (24 hr) and drain tile lag time (12 hr).
- A deep impervious layer where set to 1500 mm.
- The Penman/Monteith PET method was chosen for evapotranspiration.
- Also, channel width and depth where modified.
- The model was now ready to run.

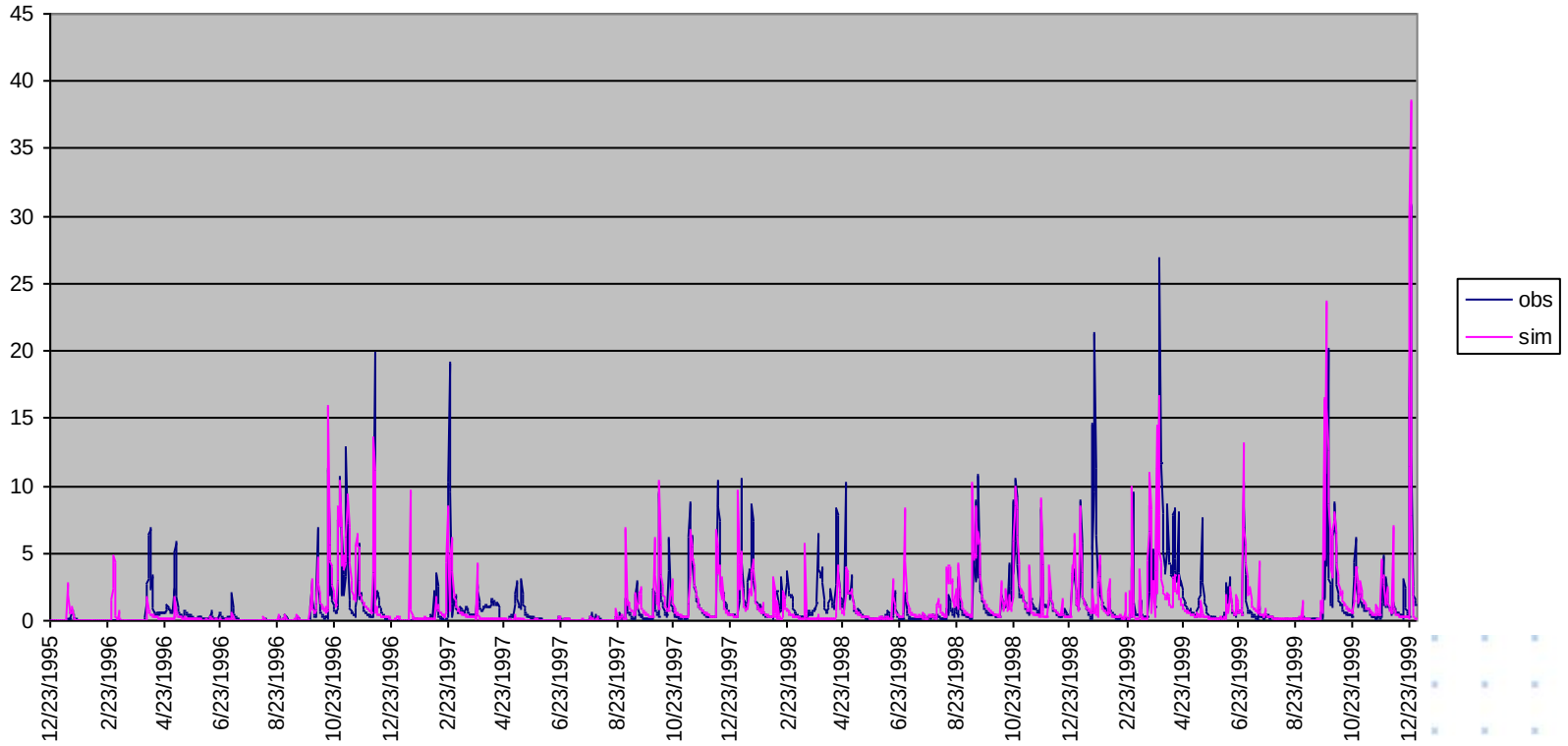
Hydrology. Observed vs. simulated flow 96-99



Results from the uncalibrated model

- The years 1994 and 1995 served as a warm up period for the model.
- The comparison between the measured and the modeled result gave a R^2=0.39 and a NSe=0.19 on a daily basis.
- When checking the plant growth the modeled yield was lower than the actual yield.
- A sensitivity analysis was preformed on the result witch showed that the alfa base flow factor (alfa_bf), soil evaporation compensation factor (esco), curve number (cn2), soil depth (sol_z) and snow pack temperature lag time factor (timp) where the most sensitive with respect to flow.
- These parameters where changed to improve the result.

Calibrated result, first try.



Results from the calibrated model

- The comparison between the measured and the modeled result gave a R^2=0.44 and a NSe=0.37 on a daily basis.
- The overall predicted water balance generated by the calibrated SWAT run (expressed as percentage of rainfall) is as follows: surface runoff (18 %); tile drainage (9 %); lateral soil Q (25 %); evapotranspiration (48 %); aquifer recharge (0 %).