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Site classification with regard to risk for diffuse pollution

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As water is the main transport medium, diffuse losses of nutrients and micropollutants are closely related to catchment hydrology. It was shown that herbicides and phosphorus are mainly exported via surface runoff. To take effective measures against surface water pollution it is thus necessary to delineate the agricultural areas that contribute fast flow to surface water bodies.

We compare three spatially distributed models to classify a site according to its risk for fast flow formation and diffuse losses, respectively, based on soil and relief data. The first model delineates the dominant runoff processes (DRP). The second approach was introduced by the Swiss Federal Research Station for Agroecology and Agriculture (FAL). It directly assesses the risk for nitrogen and phosphorus losses to surface and groundwater. In contrast to these two simple expert-knowledge derived decision trees the Soil Moisture Distribution and Routing Model (SMDR) is a mechanistic model based on the water balance calculation. It predicts the spatial distribution of saturation and runoff formation.

The implementation of these three models within a small agricultural catchment in the Swiss Plateau reveals a fair agreement of the spatial predictions. Hence, areas exhibiting a high risk for diffuse losses to surface water according to the FAL risk assessment correspond to areas of fast flow formation according to the DRP model. This agreement mainly arises from the factor soil water regime class that has a key position within the two decision trees. The DRP and FAL classifications also correspond well to the SMDR prediction of runoff patterns. Therefore, areas prone to diffuse losses to

surface water or fast flow processes according to the FAL or DRP approach, respectively, are likely to generate surface runoff or drain flow based on SMDR calculations. However, the within-class variability is rather high.

The comparison between SMDR and the two simple expert-knowledge based models will be further expanded by a regression tree that reproduces the probability of areas to generate surface runoff or preferential flow to tile drains according to SMDR simulations. This will reveal the factors that mainly trigger the fast flow formation within the physically-based model and allow for an easy conceptual comparison the three models.