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# Identification of hydrologically connected areas using a high-resolution digital elevation map

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Diffuse herbicide losses often originate from a limited part of a catchment only. These hydrologically active areas are characterized by the occurrence of fast flow processes like surface runoff. Herbicides on these active areas become mobilised and are transported by the water flow. Observations in the field showed that topographic sinks and barriers often interrupt the runoff flow into the adjacent brook. Knowledge about the connectivity of critical areas is thus crucial for the predictability of herbicide losses. However, the relevant small-scale structures can often not be derived based on an ordinary digital elevation map (DEM).

We investigated the identification of critical areas in a small agricultural catchment (2 $km^2$) in the lake Greifensee area near Zurich in Switzerland. The catchment is mainly agriculturally used, partly artificially drained and the topography is characterized by moderate slopes.

We tested the use of a high-resolution DEM (horizontal resolution of 2 meters) and of an ordinary DEM at 25m resolution with standard terrain analysis algorithms. Only the high-resolution DEM allowed the determination of internal sink areas not connected to the stream network. To verify the calculated areas, a detailed field survey was conducted. The majority of the sink areas could be predicted reliably, but for the classification of other areas a survey during an actual runoff event would be necessary.

Our analysis showed that a great part of the study area is not directly connected to the stream network. Runoff water and transported herbicides originating from these areas are routed to local sinks within the catchment. The further transport of water and herbicide from these internal sinks depends on the local conditions. Water and

herbicides may either reinfiltrate, evaporate or overflow the barrier if the water table increases too much. Drains underlying such internal sink areas may create shortcuts to the stream network if they are connected by preferential flow paths.