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# Placement of buffer strips to protect aquatic ecosystems – do we need to go outside?

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In intensively agriculturally used regions, surface runoff often contains sediments, pollutants and nutrients which may badly influence the stream water quality. One possibility to reduce nutrient and sediment input into surface waters is by installing buffer strips which are supposed to retain these pollutants. In Austria, buffer strips obtain funding within the Austrian agri-environmental programme (ÖPUL) when placed alongside permanent streams. However, flow convergence may take place in ditches or channels long before approaching the river system. Under these circumstances, buffer strips may not contribute effectively to reduce pollutant input.
To assess the dimension of such a scenario we carried out a detailed field survey in the Weinviertel area of Lower Austria, a region which is known to be highly affected by soil erosion and pollutant input into aquatic ecosystems. Ditches, channels and comparable linear structures known to concentrate convergent flow paths were mapped in five small subcatchments (size between 1 and 4 km2) of the Weinviertel region. Surface flow paths were modelled either automatically or by integrating these linear structures. The critical catchment areas which drained unprotected into the streams were identified for both cases.
Automatic calculation of surface flow paths was not able to identify critical unprotected areas compared to integrating the mapped linear structures which were obtained by field inspection. In three out of five subcatchments such critical areas were found. The size of these unprotected areas within the test subcatchments varied between 10 and 40% of the total area.
We also tested the impact of grid resolution and the implementation of different runoff algorithms. Three different DEM's (resolution 10m by aerial photograph evaluation, 1m by laserscan and 10m generated from 1m laserscan) and two different runoff algorithms were used for both the automatic and the mapped convergent flow situation. Application of a D8 versus D-Infinity algorithm did not affect results, whereas the impact of grid resolution was slightly higher. The biggest influence by far was caused by the implementation of the mapped linear structures.
The results obtained question the ability of desktop modelling approaches to identify critical areas within these catchments or place effective counter measures against surface pollution. Correct placement of buffer strips in small catchments like ours requires detailed field mapping for improving water quality effectively.
Therefore the ability of a flexible installation of buffer strips in agri-environmental programmes like ÖPUL is considered to be necessary.