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Biogeochemical and hydrological control of nitrate transport in a freshwater wetland in the Ticino catchment (Italy).

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No-Point Source Pollutant (NPS) such as nutrients and pesticides, are a problem of increasing concern due to their presence worldwide in water and soil and their adverse effect on human health and the environment.

According to the report from the Commission to the Council and the European Parliament, on implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates, agriculture is a significant nitrogen contributor to the aquatic environment. This is also confirmed by reports under the Water Framework Directive. The European Community has been taking measures concerned with nitrogen pollution in waters for over twenty years. In order to limit the losses linked to agricultural activities promotes different types of actions on nitrogen management issue. One action concern buffer effect of non-fertilised strips. Riparian zones are known to function as buffers, reducing non-point source pollution from agricultural land to streams.

We examined the N buffering capacities of a riparian area along an Italian river type, such as the small lowland springs fairly common in the Ticino catchment in the Eastern part of Northern Italy. The results collected during a three-year period (2002-2004) indicated a drastic reduction of N-NO_3 concentrations, from 35 mg/l to 0.1 mg/l N-NO_3, at only 5-10 m from the crop field within the riparian strip. The comparison of groundwater nitrate and chloride trends at different depths (40-180 cm) and distance from the crop field to the stream suggested the importance of biological processes in

the nitrogen removal. Dissolved oxygen profiles and the availability of organic C in the surface soil layers suggest suitable conditions for the occurring of denitrification. Rates of potential denitrification, 55-2332 kg N_2O kg ha-1 year-1 measured by the acetylene inhibition method, fall within the maximum of the ranges reported in literature. The location of 'hot spots' of denitrification within the studied wetland riparian areas can be explained by the influence of key environmental variables such as slope, depth, soil texture and saturation and hydrologic pathways.

To understand and predict the effectiveness of riparian buffers in nitrate removal capacity a catchment scale water quality geodata base models were applied. The models take into account the landscape hydrogeologic characteristics and information concerning the territory such as land use, meteorological data, soil properties. The aim is to check if these models represents a support system for decision making processes connected to agricolture – environment relationship.