Monitoring nutrient export into the lake Vico, Central Italy

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Abstract

There is general agreement that agriculture is the main non-point source (NPS) of nutrients to water (Novotny and Chesters, 1989; Frink, 1991; Sharpley *et al*., 1999; Rekolainen *et al*., 1999). Nitrogen, in particular in the form of nitrates, being very soluble, generally reaches groundwater dissolved in percolating water and it is the most common aquifer contaminant from NPS. Phosphorus, on the contrary, is exported prevalently bounded to soil eroded particles, being, in consequence, a threat for surface waters.

Quantitative evaluation of nutrient load must deal with complexity and related uncertainty in predictive methods. As a consequence: (i) long monitoring periods are necessary to assess mechanisms and processes; (ii) the use of simulation models is fundamental provided that such models take into consideration land use and management and include tools to manage uncertainty. In fact, not only the uncertainty intrinsic in model simulations has to be taken into account, but also the one deriving from the variability inherent in the investigated reality.

These problems are of growing importance for worldwide water quality and land use managers as legislation becomes more stringent. At a European scale, for example, the Water Framework Directive (60/2000/EC) is intended to force member states to reach freshwater quality standards with well defined deadlines .

In this contribution the case of the basin of the lake Vico in Central Italy is discussed, where the role of NPS in the considerable increase in P water concentration respect to the previous decades is evident (Ripa et al., 2006). This increase has been mainly attributed to hazelnut tree cropping that between the end of the fifties and the beginning of the nineties took the place of conventional extensive agriculture (mainly cereals).

Specific aim of the present paper is to report the results of the monitoring activity carried out in the whole basin, aimed to understand the nutrients export to the lake.

As far as regarding nitrate, some shallow aquifers fed by agricultural intensive areas were monitored: nitrate content was measured in wells and springs and compared to nitrate water content of the lake.

As far as regarding phosphorus, some landscape units were monitored where runoff were collected and phosphorus content analysed: (i) the Scardenato creek, a small sub-basin (2,7 km^2) contributing to the lake, whose land use is representative of the whole lake watershed (mostly wood and hazelnut crops); (ii) an intensively tilled field (hazelnut); (iii) wood (coppiced oak, with ten years cut recurrence); (iv) a recently clear-cut wood.

Results are discussed, to understand the magnitude of nutrient export into the lake and verify evaluation models. While regarding nitrate the understanding is rather clear, with reference to phosphorus more information is needed, because it is necessary to collect other runoff events.