



## **Hydrogeological features conditioning trophic levels of quarry lakes in western Po plain (north-western Italy)**

Domenico Antonio De Luca, Sara Castagna, and Manuela Lasagna  
Earth Sciences Department, Turin University, Turin, Italy (domenico.deluca@unito.it)

Quarry lakes occur in plains areas due to the extraction of alluvial sand and gravel used for grout and concrete in the construction industry. Excavation depths can reach and intersect the groundwater surface, thus creating a lake. Because of the need to optimize efficiency, the number of active open pit mines has increased in recent years; consequently, the global number of pit lakes will increase in coming decades (Castendyk and Eary 2009; Klapper and Geller 2001; Castro and Moore 2000). Similar to natural lakes, pit lakes are subject to eutrophication process, both during and after quarrying activity; during mining activity, the eutrophic level is strongly controlled by the excavation method.

In the Piedmont territory (north-western Italy) there are 70 active quarry lakes, corresponding to approximately 0.1% of the entire plain area. Quarry lakes, located primarily along the main rivers occur in alluvial deposits of the plain area and have average depths between 20 and 30 m (maximum of 60 m deep) and surface areas between 3 and 30 hectares (Castagna 2008). The present study describes the trophic status of 23 active quarry lakes in the Piedmont plain that were evaluated by applying classifications from scientific literature. Currently, the majority of the studied quarry lakes may be defined as mesotrophic or eutrophic according to the trophic state classifications. Based on historic data, lake trophic levels have increased over time, during active mining. At the end of mining activity, further deterioration of water quality was expected, especially for smaller lakes with minimal oxygen stratification and higher levels of nutrients and algal growth.

In addition, the paper focuses on the pit lake water quality and pit dimension;

From an environmental perspective the excavation of quarry lakes with an appreciable size will likely result in a better safeguard of water quality and enhanced possibilities for lake end use after the cessation of mining. Piedmont quarry lakes, for the most part, have rather large depths (over 20 m), and moreover, unlike natural lakes, this type of lake is not influenced by sewage inputs that are often a primary cause of eutrophication in natural lakes. It was shown that, in Piedmont, lakes with a larger depth and volume generally had a lower tendency towards eutrophication.

### References

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