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Ecosystem simulation modeling of nitrogen dynamics in the restored lake Karla in Greece

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ABSTRACT

Restored lakes are complex dynamic ecosystems. Ecosystem-level modeling of the processes that take place in a lake is a useful tool for understanding lake function and structure and for making predictions. A nitrogen dynamics model for the lake currently undergoing restoration in the area of Karla in Greece is presented. The model includes the area's hydrology and geomorphology and is used to explore the role of different lake structures and functions on nitrogen dynamics in the restored ecosystem, in order to provide a better understanding of the processes involved in nutrient retention by the lake. Seven forms of nitrogen are included in the model: ammonium, nitrite/nitrate, organic, nitrogen stored in algae and macrophytes, and nitrogen stored in active and deep sediments. The processes of ammonification, remineralization, nitrification, denitrification and sedimentation are mathematically modeled using equations from the literature adjusted to the hydrology and special conditions of lake Karla. Results show that most of the incoming nitrogen is sequestered by the lake, while 6.7% of it gets lost in the atmosphere through denitrification. Primary producers play an important role in nitrogen cycling in the lake, while an important part of the nutrient is stored away permanently in deep sediments.

Keywords: Restored lake; Nitrogen; Ecological modeling; Mathematical modeling

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