

Interactive comment on “An optimisation approach for shallow lake restoration through macrophyte management” by Z. H. Xu et al.

Anonymous Referee #2

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This is an interesting study on optimizing shallow lake phytoremediation through macrophyte planting and harvesting management. The authors use common reed at the Baiyangdian Lake for a case study. A one-year field experiment is focusing on the effects of initial planting area and harvesting time on the concentrations of total nitrogen (TN) and total phosphorus (TP). The optimization problem is set to minimize the sum of the gap indices which is defined respectively for TN and TP as the exceeding concentration ratio with respect to a targeting concentration. It is then concluded that an optimized scenario is of a planting area of 40% (123km²) and harvesting time in June.

I found this is to be a very good paper if the following two aspects could be more adequately addressed: 1) Description of experiments and calculations, 2) Distinguish

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between simulation and the field experiment results. These concerns are seen specifically at:

1. Page 812, line 9 “The monthly average nutrient inputs for total nitrogen (TN) and total phosphorus (TP) are 21.83 and 0.56 t respectively (Zhao et al., 2010). The monthly average TN and TP concentrations in the lake were respectively 5.15 and 0.54 mg L⁻¹ from 2000 to 2009 ...” There is no reference for the source of the averaged concentrations. It should be mentioned if any field measurement has been made or otherwise some discussion on how the averaged concentrations are calculated. The monthly input mass ratio between TN and TP is close to 40. The average concentration ratio between TN and TP is close to 10. Explanation would be needed for such differences / discrepancy.

2. Page 815, line 8 / Table 1 The contribution of sediments removal of TN is close to 10 times to that of TP. “The efficiency of rhizosphere denitrification can be doubled.” From Table 1, the total nutrient absorbed (aboveground and underground) for TN is roughly 10 times as of that for TP. This cannot explain the total input difference seen for TP and TN. The experiment has been mentioned within the text so there could be some more systematical comparison in between the experiment result and the simulation results. Suggesting including overall mass balance tables for both TP and TN.

3. Page 816, line 18 / Table 2. The evapotranspiration for zone 2 in March, April, October and November is ignored. Explanation is expected.

4. Page 819, line 15 I noticed that only the monthly harvesting rates for the 5 growing months were selected as the input parameters for AGA, the initial reed planting area was not considered. I wonder if there is any motivation for the way the method has been used. The methodology appears good, while not all the details on Adaptive Genetic Algorithm (AGA) are clear to me. It is then suggested for more discussion on the application.

5. Page 820, line 22 / Table 4 The gap index appears to be monthly averaged value

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throughout the year. Clarification is needed if this is the case.

6. Fig.1 / Page 821, line 16 The curve for the “current area” appears to be field measurements. The starting point of the curve then should correspond to a specific TP or TN concentration measured in 2010. This presumably should be different from the 2002-2009 averaged values. It has been mentioned in the text some extrapolation has been done. Explanation / clarification would be expected.

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