

Simulating the Effect of Chlorine on Dynamic of Main Aquatic Species in Urban Lake with a Mini System Dynamic Model

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Abstract : Urban lakes play an invaluable role in urban water systems such as flood control, landscape, entertainment, and energy utilization, and have suffered from severe eutrophication over the past few years. To investigate the ecological response of main aquatic species and system stability to chlorine interference in shallow urban lakes, a mini system dynamic model, based on the competition and predation of main aquatic species and TP circulation, was developed. The main species of submerged macrophyte, phytoplankton, zooplankton, benthos and TP in water and sediment were simulated as variables in the model with the interference of chlorine which effect function was attenuation equation. The model was validated by the data which was investigated in the Lotus Lake in Guangzhou from October 1, 2015 to January 31, 2016. Furthermore, the eco-exergy was used to analyze the change in complexity of the shallow urban lake. The results showed the correlation coefficient between observed and simulated values of all components presented significant. Chlorine showed a significant inhibitory effect on *Microcystis aeruginosa* and *Rachionus plicatilis*, *Diaphanosoma brachyurum* Liévin and *Mesocyclops leuckarti* (Claus). The outbreak of *Spirogyra* spp. inhibited the growth of *Vallisneria natans* (Lour.) Hara, caused a gradual decrease of eco-exergy, reflecting the breakdown of ecosystem internal equilibria. It was concluded that the study gives important insight into using chlorine to achieve eutrophication control and understand mechanism process.

Keywords : system dynamic model, urban lake, chlorine, eco-exergy

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