

专论与综述

基于管理目标的湖泊生态系统动力学

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摘要 基于生态系统管理的目标, 在对相关研究分析的基础上, 依据生态系统生态学、淡水生态学的理论, 提出了湖泊生态系统动力学研究的2个理论基础: 生态系统管理和生态系统特征。在此基础上, 分析得到湖泊生态系统动力学研究方法体系, 主要包括研究内容与技术路线、关键问题识别和动力学模拟、湖泊生态系统的适应性管理决策等部分。其中, 湖泊生态系统结构和过程、湖泊中食物网营养动力学研究、生源要素循环、湖泊中关键过程的生态作用以及湖泊生态系统动力学模拟是研究的核心问题。此后, 以P为主要的生源要素, 将生态系统分为3个子过程: 入流、出流和内部反馈, 并以此建立了湖泊生态系统动力学的模型框架, 以辅助于湖泊的生态系统管理。

关键词 [生态系统动力学](#); [湖泊](#); [生态系统管理](#); [模拟](#); [食物网](#)

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Management-oriented characterization of lake ecosystem dynamics

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Abstract Over the past two decades, deterioration of lake ecosystems associated with rapid socio-economic development in China has acquired much attention by the public and the government. As a result, effective management for lake ecosystems is desired in response to this increasing concern and stress. Lake ecosystem management practices can be significantly improved through better understanding of lake ecosystem dynamics which is one of the fundamental disciplines in ecological dynamics. Previously, extensive efforts have been placed on the examination of ecological dynamics within ocean, forest and grassland systems as well as its application to the relevant ecosystem management. However, very few studies have been reported on the ecological dynamics of lake systems. As an extension of previous efforts on ecosystem dynamics studies, this paper focuses on the management-oriented characterization of dynamics in lake ecosystem in order to improve the overall quality of lake ecosystems and sustain a healthy lake-ecosystem condition. Based on the fundamental theories from ecosystem ecology and aquatic ecology, the characterization of lake ecosystem dynamics in this study begins with identification of major characteristics of lake ecosystem, including holism, dissipative structure, ecosystem health and services, followed by the examination of practical measures for restoring structure and function of lake ecosystems. Modeling of lake ecosystem dynamics is then conducted to reflect crucial dynamics factors and simulate various processes in lake ecosystem, such as mass inflow and outflow, system structure, food chains and network, nutrimental dynamics, internal nutrient circulation, and their ecological effects. The modeling results could be used to assist lake authorities in making lake-related decisions. In order to reflect system complexities, adaptive management measures can be incorporated into the practical management activities. It is observed from this study that characterization of lake ecosystem dynamics could not only help scientists, engineers, and planner better understand complexity o

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f lake ecosystem and interactions among system components from a systematic standpoint, but also help local authorities enhance their management capabilities and thus improve their management practices.

Key words [ecosystem](#) [dynamics](#) [lake](#) [ecosystem](#) [management](#) [modeling](#) [foodweb](#)

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