《Acta Ecologica Sinica》 2003-09

Evaluation, planning and prediction of ecosystem services of urban green space:A case study of Yangzhou City

LI Feng,WANG Ru Song (Research Center for Eco Environmental Science, Chinese Academy of Science,Beijing 100085,China).

City is a kind of social economic natural complex ecosystem, dominated by human activities. Urban green space is an important constituent part of urban natural ecosystem. It has important ecosystem services. Ecosystem services of urban green space are that green space can provide physical and mental products, environment, resource, and ecological commonwealth,maintaining human activities and people's body and mind health. They include purifying environment, adjusting micro climate, keeping water, circulating nutrition, sustaining biodiversity, landscaping, preventing and reducing natural disaster, providing amenity, culture, education and society functions. Ecosystem service is one of focus issues of urban ecosystem research. The studies of ecosystem services of urban green space in overseas countries are mainly about urban forest and they focus on urban environment improvement, biodiversity maintenance, amenity values, and ecosystem management, while in China they focus on urban environment improvement, evaluation of urban green quantity and quality, value estimation, and evaluating indicator system. Taking Yangzhou city as a case study, according to social economic natural complex ecosystem theory and ecological planning principles, refering to international standards, ecosystem services of urban green space were planned. Based on green space status, topography, natural environment and people's demand for ecosystem services, three ring greenbelts were planned. They are composed of inner, outskirts, and outer greenbelt. Six indicators were planned at different phases in details including greening coverage ratio, mean green space per person, public green space per person, green space structure, green space distribution, and native species dominance. The planning results were evaluated and predicted at different phases using Polygon Synthesis Indicator method. The results indicate that the synthesis index of ecosysten services of green space of Yangzhou urban area was 0 272 in 2000, so the ecosystem service belonged to class III and was general. The synthesis index will be 0.391 in 2005, so the ecosystem service also belonged to class III and was general. It will be 0.586 in 2010, so the ecosystem service will belong to class II and will be bettter. It will reach to 0.777 in 2020, so the ecosystem service will belong to class I and will be excellent. Ecosystem services of urban green space depend on scientific ecological planning and appropriate ecological management. In order to gain the anticipative planning aim, implement, supervision and management after planning must be strengthened by using legal, economic, administrative, social, and technological means. Some countermeasures were advanced from ecological viewpoint for urban greening of Yangzhou city: from ground greening to roof and vertical greening; from local greening to regional greening; from occupying green space to resuming these spaces for greening; from monotone green space to various green space; from green space structure to green space function; from external greening to internal culture; from landscaping design to ecological design. It should be pointed out that urban ecological construction can be carried out by various approaches not only by greening. During the construction of urban green space, urban characteristics should be embodied, at the same time, the development, maintenance and management costs also should be taken into account.

【Key Words】： **city green space indicator ecosystem services Yangzhou City**

【Fund】： 国家自然科学基金重点资助项目(39930040)~~

【CateGory Index】： TU985

【References】

Chinese Journal Full-text Database 10 Hits

1 KANG Wei-feng(College of Resources and Environmental Sciences,Quanzhou Normal University, Quanzhou,Fujian 362000,China);RS-based Analysis of Ecology Greenland Variety in Xiamen City[J];Journal of Shihezi University(Natural Science);2006-05

Yao Xianming1 Kang Wenxing2 (1 Hu'nan Environment Biological Polytechnic,Hengyang 421005 Hu'nan China;2 Central South University of Forestry and Technology Changsha 410004 China);Study on

2 421005,Hunan,China;2 Central South University of Forestry and Technology,Changsha 410004,China);Study on Evaluation Indices and Methods of Urban Forest Ecosystem Social Service Valuation[J];World Forestry Research;2007-04

3 CHEN Fang~1,ZHOU Zhi-Xiang~(1,*),XIAO Rong-Bo~(1,2),WANG Peng-Cheng~1,LI Hai-Fang~(1,3),GUO Er-Xiang~4, (1.Huazhong Agricultural University,Wuhan 430070,China;2.Research Center for Eco-environmental Sciences,Chinese Academy of Sciences,Beijing 100085,China;3.Guilin University of Technology,Guilin 541004,China;4.Wuhan Iron and Steel Company,Wuhan 430083,China).;Estimation of ecosystem services of urban green-land in industrial areas:A case study on green-land in the workshop area of the Wuhan Iron and Steel Company[J];Acta Ecologica Sinica;2006-07

4 XIONG Chun-Ni,WEI Hong,LAN Ming-Juan Key Laboratory of Eco-environments in Three Gorges Reservoir Region(Ministry of Education),Chongqing Key Laboratory of Plant Ecology and Resources Research in Three Gorges Reservoir Region,School of Life Science,Southwest University,Chongqing 400715,China;Analysis of connectivity on greenland landscape in metropolitan region of Chongqing City[J];Acta Ecologica Sinica;2008-05

5 CHENG Jiang1,2,YANG Kai2,,XU Qi-Xin2 1 State Key Laboratory of Estuarine and Coastal Research,East China Normal University,Shanghai 200062,China 2 School of Resources and Environmental Sciences,Key Laboratory of Urbanization and Ecological Restoration,East China Normal University,Shanghai 200062,China;Rainfall-runoff storage-infiltration effect of LUCC in highly urbanized region on a catchment's scale:Shanghai urban green space system as an example[J];Acta Ecologica Sinica;2008-07

6 CAO Shun-ai,WU Ci-fang,YU Wan-jun (Southeast Land Management Collage,Zhejiang University,Hangzhou 310029);Evaluation of Land Ecological Service and Its Application in Overall Arrangement of Land Use——A Case Study of Xiaoshan,Hangzhou[J];Journal of Soil and Water Conservation;2006-02

7 ZHANG Yi-chuan,QIAO Li-fang, YAO Lian-fang(College of Landscape Architecture of Henan Institute of Science and Technology,Xinxiang,Henan 453003,China);A Study on the Landscape Ecological Design of Urban Green Land[J];Journal of Northwest Forestry University;2006-04

8 LOU Cai-rong, YOU Hai-mei, SHEN Hui-xin(School of City and Environment, Xuzhou Normal University, Xuzhou, Jiangsu, 221116,China);Analysis of Landscape Structure of Park Green System in Xuzhou City[J];Journal of Xuzhou Normal University(Natural Science Edition);2005-01

9 ZHAO Lin-sen, GAO Ze-rui (Faculty of Landscape Architecture, Southwest Forestry College, Kunming Yunnan 650224, China);Research Advances on Quantitative Benefit-Cost Analysis of Street Tree Cultivation and Management in Urban Area[J];Journal of Southwest Forestry College;2004-03

10 LI Feng,WANG Rusong (Research Center for Eco-Environmental Science,Chinese Academy of Sciences,Beijing 100085,China).;Research advance in ecosystem service of urban green space.[J];Chinese Journal of Applied Ecology;2004-03

【Citations】

Chinese Journal Full-text Database 7 Hits

1 Ma Shijun Wang Rusong(Research Center of Ecology, Academia Sinica);THE SOCIAL-ECONOMIC-NATURAL COMPLEX ECOSYSTEM[J];Acta Ecologica Sinica;1984-01

2 WANG Ru Song (Research Center for Eco Environmental Sciences,Chinese Academy of Sciences,Beijing 100080,China);The frontiers of urban ecological research in industrial transformation[J];ACTA ECOLOGICA SINICA;2000-05

3 Yan Shuiyu(Department of Environmental Science and Technology,East China Normal University,Shanghai 200062),Wang Xiangrong(Department of Environmental Science and Engineering Fudan University,Shanghai,200433).;Advances of Research on Ecosystem Service.[J];Chinese Journal of Ecology;2002-05

4 LIU Yanfang 1 MING Dongping 1 YANG Jianyu 1 (1 School of Resource and Environment Science,Wuhan University,129 Luoyu Road,Wuhan,China,430079) [FK(W7?40ZQ];Optimization of Land Use Structure Based on Ecological Green Equivalent[J];Editoral Board of Geomatics and Information Science of Wuhan University;2002-05

5 ZHU Ning,LI Min,CHAI Yixin (Northeast Forestry University,Harbin 150040).;Ecological functions of green land system in Harbin.[J];Chinese Journal of Applied Ecology;2002-09

6 ZHANG Hao1,WANG Xiang-rong2 -1.Department of Environmental Sciences, East China Normal University, Shanghai 200062, China；2.Department of Environmental Sciences and Engineering, Fudan University, Shanghai 200433,;Three-dimensional ecological characters of urban green space and its ecological function[J];China Environmental Science;2001-02

7 Ye Wenhu , Wei Bin,Tong Chuan (Center for Environmental Sciences, Peking University, Beijing 100871). ;Measurement and application of urban ecological compensation .[J];CHINA ENVIRONMENTAL SCIENCE;1998-04

【Secondary References】

Chinese Journal Full-text Database 10 Hits

ZHAO Kai,LI Hui,ZHU Xue (College of urban construction and management,Yunnan university,KunMing

1 650091,China);Spatial Extension of Fugong City Based on Ecological Safety Pattern[J];Tropical Geography;2008-06

2 TANG Yan-qiu1,GAO Fei1,CHEN Jia2,XIONG Qiang1(1.Chongqing Institute of Environmental Science,Chongqing 400020,China;2.College of Bioengineering of Chongqing University,Chongqing 400044,China);Evaluation Studies on Green Development of Industry in Chongqing[J];Sichuan Environment;2007-05

3 ZHANG Ya-bin,PENG Wen-ying,LI jun(Institute of Urban,Capital University of Economics and Business,Beijing 100070,China);Evaluation and Discuss of Constructive Approach of Beijing,Eco-city and Urban suitable For Living[J];Journal of Capital University of Economics and Business;2006-04

4 Zhu Peng Yao Yifeng (Departmentof Urban and Resources Science,Nanjing University,Nanjing 210093 China);Exploring the Application of Landscape Ecology to Urban Green Space System Planning——a Case Study of Changzhou Xinbei Region[J];Journal of Capital Normal University;2005-04

5 Zhu Peng Yao Yifeng(Department of Urban and Resources Science,Nanjing University,210093,Nanjing,China);URBAN GREEN SPACE SYSTEM STUDY FROM THE ANGLE OF LANDSCAPE ECOLOGY——A CASE STUDY OF ZHANGZHOU XINBEI REGION[J];Journal of Shandong Normal University(Natural Science);2006-01

6 Yao Xianming1 Kang Wenxing2 (1 Hu'nan Environment Biological Polytechnic,Hengyang 421005,Hu'nan,China;2 Central South University of Forestry and Technology,Changsha 410004,China);Study on Evaluation Indices and Methods of Urban Forest Ecosystem Social Service Valuation[J];World Forestry Research;2007-04

7 WU Jin-hui,LI Zhan-bin,LI Peng,SHEN Zhong-yuan(Institute of Water Resources and Hydroelectric Power,Xi'an University of Technology,Xi'an 710048,China);Discussion of the Soil and Water Conservation Monitoring and Ecological Restoration about the Tunnel through Construction of the WEPP[J];Research of Soil and Water Conservation;2007-04

8 YANG Jin-huai1,2,SUN Yan-hong3,ZHANG Hong-jiang1,SHI Jian1(1.College of Soil and Water Conservation,Beijing Forestry University,Beijing 100083,China;2.Beijing Water Department,Beijing 100038,China;3.Yanqing Water Department,Yanqing,Beijing 102100,China);Current Situation and Trend of Water Resource Management in China[J];Research of Soil and Water Conservation;2007-06

9 XIE Zheng-lei,XU Xue-gong(The Main Lab of Ministry of Education Research on Analysis and Simulation of the Earth's Surface Process,College of Environment,Peking University,Beijing 100871,China);The Competition Mechanism Between Green Space and Urban Land Based on Nonlinear Model——a Case Study of Beijing[J];Research of Soil and Water Conservation;2007-06

10 JIA Zhi-rong~(1,2) GUO Zhong-yin~2 (1.School of Architectural Engineering,Shandong University of Technology,Zibo,Shandong 255049,China;2.Key Laboratory of Traffic Engineering of the Ministry of Education,Tongji University,Shanghai 200092,China);Quantifying Evaluation Approach to Highway Soil Bioengineering[J];Research of Soil and Water Conservation;2008-02

China Proceedings of conference Full-text Database 4 Hits

1 HUANG Heping1, XIE Xiaoying2 (1. School of Resources and Environmental Management, Jiangxi University of Finance & Economics, Nanchang 330032; 2. Library of Jiangxi University of Finance & Economics, Nanchang 330013);Ecological Civilization of China’s Forestry Sustainable Management in the New Century[A];[C];2008

2 Su Chao-yang Miao Chang-hong (Research Center of Yellow River Civilization and Sustainable Development and College of Environment and Planning,Henan University,Kaifeng 475004,China);Based on the Value of Ecosystem Services of Land Use Planning assessment in Kaifeng[A];[C];2008

3 GAO Ze-rui, ZHAO Lin-sen, LIU Lin, GAO Xi;Benefit-cost Analysis on Tending and Administration of 4 Major Species Street Trees in Kunming Urban Area[A];[C];2005

4 Huang Heping Xie Xiaoying 1.School of Resources and Environmental Management,Jiangxi University of Finance & Economics,Nanchang 330032; 2.Library of Jiangxi University of Finance & Economics,Nanchang 330013;Ecological Civilization of China's Forestry Sustainable Management in the New Century[A];[C];2008

【Secondary Citations】

Chinese Journal Full-text Database 10 Hits

1 ZHANG Gui xiang, HUANG Ling yun, LIU Yan sui;Regional Optimizing Model of Land Utilizing Structure and the Elasticity Problems of Coastal Plantation Homeostasis——with Yueqing City in Chekiang Province as an Example[J];THE JOURNAL OF SHANXI TEACHERS UNIVERSITY(NATURAL SCIENCE EDITION);2000-03

2 WANG Ru Song (Research Center for Eco Environmental Sciences,Chinese Academy of Sciences,Beijing 100080,China);The frontiers of urban ecological research in industrial transformation[J];ACTA ECOLOGICA SINICA;2000-05

3 Jiang Yunfang; Shi Tiemao(Dept.of Arch.,Shenyang Arch.and Civ.Eng.Inst.,Shenyang,110015,China);A analysis for settlement ecological open space system in shenyang city[J];JOURNAL OF SHENYANG ARCHITECTURAL AND CIVIL ENGINEERING INSTITUTE;1999-02

4 GENG Hong 1 WANG Zemin 2 (1 School of Land Science,WTUSM,129 Luoyu Road,Wuhan,China,430079) (2 School of Geo_science and Surveying Engineering,WTUSM,129 Luoyu Road,Wuhan,China,430079);Research on Optimization of Land Use Structure Based on Gray Linear Programming[J];JOURNAL OF WUHAN TECHNICAL UNIVERSITY OF SURVEYING AND MAPPING(WTUSM);2000-02

5 Zhang Liangpei (Wuhan Technical University of Surveying and Mapping) Zheng Lanfen Tong Qingxi (The Institute of Remote Sensing Applications,Chiniese Academy of Sciences);The Estimation of Vegetation Variables Based on High Resolution Spectra[J];Journal of Remote Sensing;1997-02

6 Gong Peng; Pu Ruiliang; Yu Bin (University of California at Berkeley, USA);Conifer Species Recognition with Seasonal Hyperspectral Data[J];JOURNAL OF REMOTE SENSING;1998-03

7 Zeng Dehui, Jiang Fengqi, Fan Zhiping and Du Xiaojun (Institute of Applied Ecology, Academia Sinica, Shenyang 110015).;Ecosystem health and sustainable development for human[J];CHINESE JOURNAL OF APPLIED ECOLOGY;1999-06

8 ZHAO Jingzhu, XIAO Han and WU Gang (Research Center for Eco Environmental Sciences, Chinese Academy of Sciences, Beijing 100085);Comparison analysis on physical and value assessment methods for ecosystems services[J];CHINESE JOURNAL OF APPLIED ECOLOGY;2000-02

9 REN Hai (South China Institute of Botany,Chinese Academy of Sciences, Guangzhou 510650),WU Jianguo (Department of Life Sciences, Arizona State University West, Phoenix, AZ 85069 USA) ,PENG Shaolin (Guangzhou Branch of Chinese Academy of Sciences, Guangz;Concept of ecosystem management and its essential elements.[J];CHINESE JOURNAL OF APPLIED ECOLOGY;2000-03

10 XIAO Han,OUYANG Zhiyun,ZHAO Jingzhu,WANG Xiaoke (Research Center for Eco Environmental Sciences, Chinese Academy of Sciences, Beijing 100080).;Forest ecosystem services and their ecological valuationA case study of tropical forest in Jianfengling of Hainan island.[J];CHINESE JOURNAL OF APPLIED ECOLOGY;2000-04